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FACTORS RELATED TO HEARING LOSS AMONG CONSTRUCTION WORKERS IN MIDRAND GAUTENG, SOUTH AFRICA

A research proposal presented to the

Faculty of Health Sciences,

University of Johannesburg,

In partial fulfilment of Master of Public Health

By

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Supervisor: _____ **15/01/2021**

Prof Shingairai A Feresu **Date**

DEDICATION

To God the Father, Son and Holy Spirit who not only gives second chances but several do-overs.

Opeoluwa Michael Oguntimirin, your love keeps propelling me, continue to rest in peace.

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FULFILMENT STATEMENT

I, Lara Oguntimirin hereby declare that this dissertation is the result of my investigation and research, and it has not been submitted in part or full for any degree to any other University or college.

I confirm that:

1. This work was done wholly while in candidature for a master of public health degree at University of Johannesburg South Africa.
2. Where I have consulted the published work of others, I have attributed and cited
3. Where I have quoted from the work of others, the source is always given.

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_____ 15/01/2021

Oguntimirin Lara Date

Abstract

Background: This study supports the fact that noise induced hearing loss is a predominant occupational disease among construction workers. The overall aim of this study was to identify socio-demographic factors, family and personal history, occupational health and environmental related factors associated with noise-induce hearing loss (NIHL) among construction workers in Midrand Gauteng province, South Africa.

Methods: A quantitative analytic cross-sectional study was done whereby primary data and secondary data of respondents were used Statistical analysis used includes descriptive and binary logistic regression.

Result: A total of 400 respondents were recruited, of which 164 had noise-induced hearing loss (NIHL), and 236 did not have NIHL. Variables examined included socio-demographic data, family and personal history as well as occupational health and environment; the percentage hearing loss factor was used to determine the study outcome (NIHL). Findings indicated a male-dominated industry with 94% respondents, the age of 25years and below were significantly protected against hearing loss with OR= 0.09; 95% CI (0.02-0.34), workers whose worksites were located in closed sites/indoors had significantly reduced risk of exposure. Factors such as not working in the noisy area OR= 0.51; 95% CI (0.3-0.9), reduced length of working in construction below 4years OR= 0.27; 95% CI (0.15 -0.48) and non- use of heavy machinery were all significantly protective against hearing loss.

Conclusion: There is a relationship between the lengths of working in the construction industry, the use of heavy machinery, noise levels on open sites and NIHL among construction workers. Hearing conservation program that includes engineering and administrative measure in addition to the use of hearing protective equipment will reduce the risk of exposure

Keywords

Noise-induced hearing loss, construction workers, related factors, demographic, occupational health

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LIST OF ABBREVIATION

Abbreviations	Explanation
NIHL	Noise-induced hearing loss
WHO	World Health Organisation
Ho	Null Hypothesis
Ha	Alternate Hypothesis
PH	Public health
dBa	Decibel
OS	Onsite
HLP	Hearing loss prevention
PPE	Personal protective equipment
OHR	Occupational hygiene regulation
MHS	Mine health & safety Act
OII	Occupational injuries and illness
NHIS	National health interview survey
GCILO	General conference of international labour organisation
OHSA	Occupational health &safety Act
OD	Outdoor

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DEFINITION OF TERMS

Term	Definition
Hearing loss	a partial or total inability to hear
Hearing prevention	Use of engineering, administrative measures and personal protective devices to prevent noise exposure
Personal protective equipment	Earplugs used to prevent damage to hearing from high noise levels
Engineering measures	Modifying or replacing equipment or making related physical changes at the noise source or along the transmission path to reduce the noise level at the worker's ear.
Administrative measures	Methods that reduce exposure by limiting the time a worker is exposed to noise

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CHAPTER 1
GENERAL INTRODUCTION

1.1 Introduction

Noise-induced hearing loss (NIHL) among construction workers is a concern because the work environment in the industry is quite noisy, due to heavy machinery and outdoor activities. The levels of noise are difficult to monitor. The use of the personal protective device (PPE) in the form of hearing muffs or plugs have been the mitigating action to reduce exposure. However, its evidence that these measures are not effective, as the industry continues to record cases of occupational - NIHL. - NIHL is an important occupational health disease, because of its effect on workers' health as well as the impact on the community. Hearing loss is usually progressive and may go undetected for years (House, Sauve, & Jiang, 2010). It has psychological impacts on the affected worker and can result in stress both at work and at home. Hassel. (2013). The risk of injury increases for workers with hearing defects as they are not fully aware of their environment. Hence, this study seeks to identify the factors that contribute to hearing loss among construction workers in Midrand Gauteng. The overall objective was to identify occupational, health and socio-demographic factors that contribute to hearing loss among construction workers in Midrand Gauteng South Africa

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1.2 Background of Study

In South Africa the noise levels acceptable are outlined in the NIHL regulations, Occupational Health and Safety Act 85 of 1993 and the Occupational Hygiene Regulations (OHR),
Mine Health and Safety Act 29 of 1996." that employees may not be allowed to enter a workplace where the noise level is at or above the 85 decibel noise rating limit, when not practicable, noise exposure should be controlled through the implementation of noise control measures, including engineering measures, administrative measures and use of hearing protective equipment".
Due to the consistent outdoor environment in the construction industry, compliance to legal noise levels are impossible and ensuring use of personal protective devices or equipment (PPE) is also a challenge, thus this study seeks to identify factors that contribute to hearing loss among construction workers in Midrand Gauteng, South Africa and hope to contribute to the body of knowledge by identifying effective control measures that addresses identified factors.

NIHL is preventable, and the South African government mandates hearing conservation programme. Still, a high prevalence of NIHL is reported. An audit of the department of mineral resources in South Africa reported 1 820 cases of NIHL in 2007. On an international level, (Hassel, 2013) submitted that "about 23,000 cases of occupational hearing loss were reported in 2007, and 22 million workers are exposed to potentially damaging noise each year. A study found that between 1996 and 2010, 58% of workers experienced significant abnormal hearing loss due to noise. Nearly 80% of welders had hearing loss, and 47% of roofers experienced NIHL", attributing this exposure to the various machinery used in the industry and the documented fact that the noise they produce is above the 85dB limits (Luman,2016).

The construction industry in South Africa is focused only on the use of earplugs and muffs as the measure for noise management. However, other measures can be combined to ensure effective hearing conservations in workers; limiting the time a worker is exposed to a high noise level by adopting shift hours of work, creating written operating procedures that guard site managers on hearing conservation and installing alarms that are triggered when noise levels rise above 85dB on sites(Morata,&Meinke,2016).These are some of the interventions that have not been fully evaluated and applied in the fight against - NIHL. Furthermore, the issues of machinery have been left unattended, the industry is a fort with old equipment that have worn paddings, thus increasing the decibels of noise produced by this equipment during use, there are no guidelines or legislation to stipulate the length of use of specific equipment in the industry hence the benefit of engineering measures of reducing noise exposures have not been applied. NIHL is a topic of interest in occupational health, as it has been reported to be the second-largest cause of occupational disease. Thus it is a researchable topic.

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1.3 Statement of the Problem

Hearing loss in construction workers is a major concern because it is an occupational disease that may take years to discover and, in most cases, goes undetected. (Journal of occupational and environmental medicine,2013) There is limited information on the factors contributing to occupational NIHL. Construction workers in Midrand Gauteng South Africa are exposed to noise levels that are above 85 dB daily as majority of the sites are outdoor and heavy equipment are used.

The concern, however, is that other socio-demographic, health and occupational factors may be contributing to this condition which is yet to be identified or documented hence this study seeks to identify factors that contribute to hearing loss among construction worker.

1.4 Aims and Objectives

Overall Objective

The overall aim was to identify factors related to hearing loss among construction workers in Midrand Gauteng province, and to quantify the levels of noise exposures, as well as examine the relationship between hearing loss among construction workers and socio-demographic factors, family and personal history, occupational health and environmental-related factors.

Main objective

To examine factors that contribute to hearing loss among construction workers in Midrand Gauteng South Africa

Sub objectives

1. To quantify the levels of noise among construction workers in Midrand Gauteng province, South Africa; quantification of noise was done by accessing data on noise level monitoring on sites visited and the data for the general population was obtained from Statistics South Africa;
2. To examine the relationship between hearing loss among construction workers and sociodemographic factors in Midrand Gauteng South Africa; occupational factors cover the aspect of work done by participants, socio-demographic when regressed against hearing loss gave a prediction of social aspect that impact on hearing loss;
3. To identify occupational factors contributing to hearing loss among construction workers in Midrand Gauteng South Africa;
4. To identify other health-related factors contributing to hearing loss among construction workers in Midrand Gauteng Province, South Africa.

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1.5 Research Questions

1. What are the levels of noise exposure among construction workers in Midrand Gauteng Province, South Africa?
2. What is the relationship between hearing loss among construction workers in Midrand Gauteng Province, South Africa and socio-demographic factors?
3. What are the occupational factors associated with hearing loss among construction workers in Midrand Gauteng Province, South Africa?
4. What are the health-related factors associated with hearing loss among construction workers in Midrand Gauteng Province, South Africa?

1.6 Hypothesis

Overall Hypothesis

The study hypothesis is that the factors contributing to hearing loss among construction workers in Midrand Gauteng will be associated with socio-demographic factors, occupational factors, and health-related factors. The following specific hypothesis by objective will be addressed in the study;

Specific Hypothesis

Objective 1: To quantify the levels of noise among construction workers in Midrand Gauteng province, South Africa; quantification of noise was done by accessing data on noise level monitoring on sites visited and the data for the general population was obtained from Statistics South Africa

H0: The levels of noise among construction workers in Midrand Gauteng province is the same as for the general population in South Africa

HA: The level of noise among construction workers in Midrand Gauteng province is higher than for the general population in South Africa.

Objective 2: To examine the relationship between hearing loss among construction workers and socio-demographic factors in Midrand Gauteng South Africa; occupational factors cover the aspect of work done by participants, socio-demographic when regressed against hearing loss gave a prediction of social aspect that impact on hearing loss;

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HO: There is no association between hearing loss among construction workers and sociodemographic factors in Midrand Gauteng South Africa

HA: There is an association between hearing loss among construction workers and sociodemographic factors in Midrand Gauteng South Africa.

Objective 3: To identify occupational factors contributing to hearing loss among construction workers in Midrand Gauteng South Africa;

HO: There is no association between hearing loss and occupational health factors among construction workers in Midrand Gauteng South Africa

HA: There is an association between hearing loss and occupational health factors among construction workers in Midrand Gauteng South Africa.

Objective 4: To identify other health-related factors contributing to hearing loss among construction workers in Midrand Gauteng Province, South Africa**;**

HO: There is no association between hearing loss and the health-related factors among construction workers in Midrand Gauteng Province, South Africa

HA: There is an association between hearing loss and the health-related factors among construction workers in Midrand Gauteng Province, South Africa

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1.7 Feasibility of Study

This study was feasible because it seeks to address a major issue in occupational health. (House et al., 2010) submitted that construction workers are at risk of NIHL but often have no periodic audiometric testing, concluding their study by stating “Improved prevention of hearing loss in construction workers is needed”.

1.8 Purpose of Study

The purpose of the study was to identify factors that contribute to hearing loss among construction workers in Midrand Gauteng South Africa. It seeks to evaluate socio-demographic factors that may

contribute to hearing loss as well as family. Personal history of respondents that may impact on their susceptibility of hearing loss exposure, including occupational health and environment practises that increases NIHL in the workplace. It is hoped that the study can contribute to the body of knowledge and pro offer recommendations towards reducing the occupational hazard.

1.9 Significance of Study

The study seeks to contribute to the body of knowledge by identifying socio-demographic, family and personal, occupational health and environmental-related factors contributing to hearing loss among construction workers. It seeks to extend the current literature by specifically focusing on the construction industry as opposed to just hearing loss in an occupational health setting; the study aimed to shed light on contributing factors that predispose to hearing loss thus giving information to public health and occupational health practitioners that will assist in the development of mitigating actions that are more effective and practical. It is aimed that the study will give in-depth information into the factors contributing to hearing loss and make recommendations for the reduction of the occupational diseases.

1.10 Delimitation of Study

Occupational NIHL occurs in every industry with high noise level above 85dB. However, exposure of construction workers is higher due to work in the outdoor environment and vibrating machines used in the industry.

The study focused on factors related to hearing loss among construction workers in Midrand Gauteng, and data was collected using a questionnaire and occupational health records of 400 workers, age range 25-65years that have worked for at least one year in the construction industry. Health and socio-demographic factors were identified using Ecological model as a theoretical and conceptual framework.

1.11 Summary

NIHL affects construction workers' health as well as an impact on the community. The limited information on occupational health NIHL and its impact on employees go undetected and undocumented, thus no evidence of interventions that can reduce exposure. Hence, this study seeks to identify factors contributing to hearing loss among construction workers in Midrand Gauteng, as well as identify the relationship between hearing loss, occupational health and environmental

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related factors and socio-demographic factors. Overall hypothesis was to examine factors that contribute to hearing loss among construction workers in Midrand Gauteng South Africa; it is aimed that the study will give in-depth information into the occupational and environmental conditions in the construction industry that contributes to hearing loss.

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CHAPTER 2

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

This chapter will focus on the theoretical framework and literature review as it pertains to the study

2.1 Introduction

Ecological Model was chosen as the conceptual framework for the research study.

The model describes five levels of influence on behaviour: individual, interpersonal, organizational, community and policy. All five levels influence construction workers in Midrand Gauteng South Africa.

Individual behaviour such as listening to loud music, use of earphones can impact on the worker's perception, and interpretation of noise levels at work, an individual with hearing loss struggles with psychological issues and feels disconnected with his immediate environment. The interpersonal interaction within the work environment in addition to organisational culture can create a space where workers feel safe to express concerns about hearing loss or not; Workers are part of a larger community, and the strain of having progressive hearing loss can impact immediate families and cause tension in the home, presently policies that are in place are not sufficient to protect workers from NIHL in the construction industry.

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2.2 Conceptual Framework

The figure shows the different layers of influence impacting on an individual Ecological Model

Figure 1 Ecological conceptual framework

2.2.1 Application of Theoretical/Conceptual framework

The Ecological framework(figure1) (Searchfield,2014) focuses on the interaction between and interdependence of factors within and across all levels of a health problem. It highlights people's interactions with their physical and sociocultural environments." It is thus useful in determining the factors that relate to hearing loss among construction workers in Midrand Gauteng, as well as give insight into possible interventions that can reduce prevalence. The framework will allow for evaluation of work-related factors as well as socio-demographic factors in construction workers in Midrand Gauteng.

2.2.2 Review of Literature for Conceptual framework

(Searchfield, 2014) applied the model in a study on hearing loss and submitted that "The premise of the model is that we are not passive receivers of sensory information. Instead, we seek to explain and inform as we move through our environment". This means that for every noise a human is exposed to, there is an individual interpretation for it and based on this individual perception, one may perceive the noise as a threat or as acceptable.

The model was used to determine the factors that contribute to hearing loss in the construction worker's environment (home and workplace), it also allowed for evaluation of other social factors that may contribute to hearing loss, thus adding to the credibility of the study by reducing confounders. The model was used to evaluate present behaviour and perception of construction workers in protecting their hearing, and about the level of noise, they are exposed to.

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2.3 Pathophysiology of Noise induced hearing loss

Sound waves reach the outer ear and are conducted down the ear canal to the eardrum, causing it to vibrate. The vibrations are transferred by the 3 tiny ear bones of the middle ear to the fluid in the inner ear. The fluid moves hair cells (stereocilia), and their movement generates nerve impulses which are then taken to the brain by the cochlear nerve. The auditory nerve takes the impulses to the brainstem, which sends the impulses to the midbrain. Finally, the signal goes to the auditory cortex of the temporal lobe to be interpreted as sound. Hearing loss is most commonly caused by long-term exposure to loud noises, from recreation or work, that damage the hair cells, which do

not grow back on their own, thus nerve impulses are not generated, and no information is sent to the brain by the cochlear as it has not received any impulse. (Yang, &Chung,2016)

2.4 Literature Search Strategy

The study literature search was conducted on multiple databases to ensure in-depth information was gathered relating to the study. The literature reviewed is properly cited and referenced throughout the study.

Table 1 Literature search information

Outcome or dependant variable	Noise induced hearing loss (NIHL) in construction workers
Databases searched	-PubMed -Construction chart book -National Academic of science, engineering and medicine. -Safety &Health journal -Electronic library of construction occupational health &safety
Part of the journals searched	Keywords used to search where -hearing loss in construction workers -factors related to hearing loss in construction workers
Years of search	2012 -2018
Language	English
Types of studies included	Quantitative studies Cohort studies Cross-sectional studies
Inclusion criteria	All studies that can deduct hearing loss related factors in construction workers and examine the relationship between hearing loss and socio-demographic factors as well as occupational health factors.
Exclusion criteria	All studies that focus on general hearing loss among workers were excluded because the study focused on hearing loss in construction workers only.

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2.5 Literature Review

Introduction

The level of hearing loss that has been seen among construction workers has become more alarming year in year out due to the lack of attention paid to this group of workers despite their daily exposure not only to environmental noise but to noise and vibrations from the different equipment used during their jobs. It has become urgent to determine why hearing loss continues to be reported among this group, even when personal protective equipment is used and to find out the actual factors that contribute to this occupational disease.

2.5.1 Factors contributing to hearing loss among construction workers

A construction site is a noisy place to work no matter what precautions are taken. Regular 8-hour exposures to 85 decibels can damage one's hearing Turcot, Girard, Courteau, Paril, &Larocque.(2015). If one must use a jackhammer for 1 hour per day, one may experience hearing damage. The higher the noise level, the faster the hearing loss. For construction workers, most of the equipment they use regularly is above the 85 decibels exposure level: Jackhammer: 100 decibels, Chop saw: 105 decibels, Chain saw: 110 decibels, Hammer drill: 115decibels. Thus it can be concluded that one of the major factor contributing to hearing loss among this group is exposed to high noise levels for extensive periods (Dement et al., 2018) found that 58 per cent of the former construction workers had some form of hearing loss and, overall, had "significantly increased risk of hearing loss compared to reference populations." Besides, those who worked for more than 30 years were nearly four times more likely to experience hearing loss than workers with fewer than 10 years on the job". The construction industry has been identified as the second major contributor to hearing loss in workers; however, there is not enough literature that further identifies other contributing factors to hearing loss in construction workers.

2.5.2 Review of past statistics on hearing loss

A survey of Occupational Injuries and Illnesses (OII) data by the United State (US)Bureau of Labour from 2004 to 2010, reported only 1,400 cases of hearing loss in construction. In 2010, the rate of reported occupational hearing loss among construction workers was 0.2 per 10,000 full-time workers.

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Hearing data are also collected by the National Health Interview Survey (NHIS), a large household survey in the US reported that at least one in five (21.4%) construction workers self-reported some hearing trouble in 2010. This is nearly one-third (16.3%) higher than the proportion of workers with hearing trouble for all industries combined.

A comparison of occupation and its effect on hearing conducted by Freuler,(2014), indicates that 60% of construction workers will experience NIHL compared to 30-33% of workers in manufacturing and agriculture. Noise exposure is an important and highly prevalent occupational hazard in the construction industry. In a study were noise exposures for both ears were graded for construction workers, the grade of impairment criteria and prevalence were identified as slight (impairment less than 22.5%), moderate (impairment range between 22.6 -52.5%), severe (impairment range of 52.6 - 82.5%) and profound impairment or deafness (impairment range more than 82.5%) (Mazlan et al., 2017).

Recommended noise levels must not exceed 85 decibel/8 hours shift in line with regulations. Exposure higher than this can result in damage as supported by Mazlan et al. (2017) a worker must not be exposed to a maximum instantaneous noise level of 135 to 140decibles, as the tiny hair cell in the organ of Corti within the cochlear of the inner ear may be destroyed and cause trauma to ears, which results in the chronic effect of hearing loss (Kowalska-Shiwinska,&Davis,,2012).

(Dement et al., 2018) submitted that construction workers had significantly increased risk of hearing loss compared to reference populations, with increasing risk by work duration. Noise exposure, solvent exposure, hypertension, and smoking were significant risk factors identified.

2.5.3 Legal regulations for preventing noise-induced hearing loss in South Africa

In 1977, the General Conference of the International Labour Organization(GCILO) adopted Convention 148, regarding the protection of workers against occupational hazards due to air pollution, noise, and vibration in the workplace. This convention established in 24 articles the bases of legislation, considering measures of prevention and protection, the establishment of criteria and exposure limits for occupational noise, the promotion of occupational health research, and official recognition and concern for the health of the exposed workers. The ratification of this convention has generated similar legislation in several different countries. Others have adopted the convention,

limiting it to only some of the pollutants such as air and noise, but leaving out vibration. Arenas, &Suter. (2014) It is thus important to evaluate the present measures implemented by the construction industry aimed at mitigating noise induced hearing loss against regulations**.**

In South Africa, the predominant component of hearing conservation programs is; use of earplugs (regulation 12 of NIHL regulations) and audiometric testing of workers (regulation 8 of NHIL regulations). Review of the Occupational Health and Safety Act (85 of 1993) noise-induced hearing loss regulations outlines clearly the responsibilities of employers and employees; in summary, it details the necessary actions for mitigation such as training and information of workers (regulations 4), assessment of potential noise exposure (regulations 6), noise monitoring (regulation 7), noise zones (regulation 9) and control of noise exposure (regulation 10).

It is interesting to note that regulation 5 outlines the responsibilities of workers in reporting noise related concerns and deviations by employers, the reality, however, is that workers in the construction industry are mostly semi-skilled migrants. They are perceived as not having rights in the country. Furthermore, the concern for job security seems to supersede concerns for the discomfort caused by noise exposures. Thus the battle for comprehensive hearing conservation in the industry has become endless. In the meantime; workers continue to lose their hearing due to the insufficiency of current legislation and enforcement, combined with either a lack of information or a lack of will (or a combination of the two) on the part of employers, employees, and governmental agencies (Arenas & Suter, 2014).

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Another concern with the present legislation is regulation 14which outlines penalties for contravention of the NIHL, and there is a need to review regulation 14 to reflect the impact that non-compliance has on workers quality of life. Arenas, & Suter. (2014) submitted that in every case, the implementation of adequate legislation of occupational noise control will always be limited by the degree of economic development in the countries where they are applied. In many cases, small and medium-sized industries cannot comply with the legislation, making it practically inapplicable. However, the economic costs to society for loss of hearing in workers and the effective disability life-years lost to noise-induced hearing loss can result in higher costs than the implementation of adequate legislation.

2.5.4 Strategies for preventing NIHL in the construction industry

International recommendations on the prevention of NIHL are the reduction of noise exposures that is above 85 decibels in 8hours. Several evidences is presented in the literature that supports the premises that a combination of measures will produce effective noise management on construction sites. The following measures were highlighted as elements of effective hearing conservation :**1) engineering controls**: reducing or eliminating the source of the noise, changing materials, ensuring maintenance and equipment servicing, -**2) administrative controls**: changing work practices, management policies or workers behaviour; workplace layout, -**3) personal noise protection devices** and **4) hearing surveillance** which monitors the hearing levels of exposed workers.(Morata,&Meinke,2016)

The most common attempt to reduce noise happens through the distribution of hearing protectors; despite the general acceptance that noise reduction strategies in the workplace are the preferred intervention for the prevention of noise-induced hearing loss. Morata, &Meinke, (2016) the construction industry continues to use this measure just to show compliance to legislation perceiving additional mitigations as costly Ayessaki, & Smallwood. (2019).

Another important step in reducing the prevalence of noise-induced hearing loss would be the inclusion of mandatory engineering controls in the legislation of each country. Workers are not sufficiently protected with hearing protectors and other elements of the hearing conservation programs. Workers often fail to wear their hearing protectors, or they use them improperly, and these hearing protectors can also have adverse effects on communication and the perception of warning signals. Moreover, engineering controls can be less expensive in many situations because they are a one-time rather than annual expense.

2.6 Summary

NIHL in the construction industry has to be a major problem; not only in South Africa but all over the world, despite various laws and legislation that outlines the recommended noise levels in a work environment, this industry can't comply. Several construction workers struggle with hearing loss that can be reversed or prevented, but the lack of genuine commitment of employers to health and safety has deprived workers of this opportunity, Ayessaki,&Smallwood.(2019) submitted that the construction industry is forth with non-compliance to legislation and a lack of commitment to

combating NIHL; furthermore, most cases of hearing loss may not be detected for years and thus affect progression due to continual exposure. It is important to identify other mitigating factors that may contribute to hearing loss among construction workers, considering the history of chemical exposure, lifestyle and pre-existing medical conditions, giving insight into reasons for the continual upwards trend of hearing loss in this group compared to the general population.

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CHAPTER 3: METHODS

3.1 Introduction

Descriptive methodology was adopted for the study as outlined below, the method informed the study design, sampling, data types as well as statistical analysis used to include ethical considerations.

3.2 Study Design

The design for the study was a descriptive quantitative study; it allowed for the identification of exposure and factors related to it; the quantitative element ensures that the same data was collected from the entire respondent. The study design fit into my study as I aimed to identify factors related to hearing loss among construction workers in a specific region. It allowed the study to answer the research questions as well as generate the hypothesis that allowed for the submission of suggestions that can be implemented in health planning and improvement in the occupational health setting. The study was carried out by using data from occupational health surveillance on construction workers across Midrand in Gauteng, age group 25-65 years and both male and female respondents were randomly selected.

The study had a target population (construction workers in Midrand Gauteng), the stratified random sampling method was used, and sample size 402 was determined using EPI INFO version 7.10. Frequency and percentages were calculated as well as a crude odd and adjusted ratio. The rationale was that a descriptive study would allow for the identification of socio-demographic, family and occupational health and environmental factors related to hearing loss among construction workers.

3.3 Study Site

The site chosen for the study was Midrand Gauteng province in South Africa, Midrand (figure 2) (Google maps,2019), an industrial area within the province, was identified as a research setting due to the high activities of construction work. This area of Gauteng is an urban setting that attracts a lot of unskilled job seekers. Thus, a lot of casual workers involved in construction work are exposed to varying noise levels outdoor. The reason these sites was more appropriate is that data was collected not only from participants but from the environment that assisted in identifying factors that contributes to hearing loss.

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Courtesy; Google map. (2020)

Figure 2 Map of Midrand Gauteng

3.4 Target Population

The target population were construction workers in Midrand Gauteng South Africa. Gauteng has a population size of 12.27 million with Midrand Population: 87,387 (571.64 per km²) (StatisticsSA,2013) construction sites in this area account for about 10 % of the population, it attracts unskilled workers from all over Southern Africa region due to construction activities and thus the predominant language of communication is English.

3.5 Study Population

The study population was a group of construction workers between the age of 25-65years old that were working in an open site and thus exposed to a high and low level of noise on construction sites. These individuals had worked in construction for at least 1 year, had pre-employment assessment as well as periodic assessment that gives an in-depth insight into their health and wellness. The population was identified from the geographical location in Gauteng with specific attention to Midrand. Individual habits that may impact on hearing loss were explored, such as listening to loud music, use of headphones and earphones, and other socio-demographic activities that may impact on hearing loss in the study population.

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3.6 Sampling Methods

Samples – Construction workers in Midrand Gauteng

Sampling strategy chosen was the probability design -stratified random sampling Feresu. (2018). Samples were grouped into strata based on levels of noise exposures on site as follows(60-70db), (70-80db), (80-90db) and the samples were drawn from each stratum to ensure proper representation.

3.7 Selection of Study Participants

Participants were selected from a group of construction workers in Midrand Gauteng area, workers that had various levels of noise exposures were selected as the study aimed to identify factors related to hearing loss. Participants were recruited from 10 construction sites located in Midrand.

3.8 Sampling Size Estimation

The study sample size was determined using a Centre for Disease Control and Prevention (CDC) EPI INFO program version 7.10, for a population survey.

Population survey or descriptive study
For simple random sampling, leave design effect and clusters equal to 1.

Population size:	87387
Expected frequency:	50 %
Acceptable Margin of Error:	5 %
Design effect:	1.0
Clusters:	2

Confidence Level	Cluster Size	Total Sample
80%	82	164
90%	135	270
95%	191	382
97%	234	468
99%	329	658
99.9%	535	1070
99.99%	744	1488

Figure 3 EPI INFO sample size

The estimated for a population of 87,387 in Midrand Gauteng (Figure 3) Statistics SA. (2013) was used for population size. The acceptable error margin of 5% with 2 clusters of exposed (hearing loss) and unexposed construction workers (no hearing loss) was used. A sample size of 382 was estimated at 95% confidence level,80% study power odds ratio of 2 those with a hearing loss against

those without hearing loss, and additional 5% contingency is 10 for each group, thus sample size = 191 +10 = 201 in each group. The total sample size was 402.

3.9 Inclusion Criteria

Selection of participants was done by random sampling; participants were able and willing to give consent, between 25 and 65 years. Participants had worked for a construction company for 1year or more, exposed to varying noise levels ranging from 85 – 100 decibels. Participants had undergone baseline audiometry testing before joining the construction industry, as well as had a periodic hearing test at least once a year and occupational health records were available for evaluation. This was included as a criterion because participants with hearing loss based on audiometry reports need to be identified (Seixas, Natal, Stover, Sheppard, Feerey, Mills, & Kujawa, 2012).

3.10 Exclusion Criteria

Participants who have not worked in the construction industry for at least 1 year were excluded from the study as well as participants whose medical records were not available or without any audiometry reports.

3.11 Data Types

Data Types Table 2 outlines data variables which were chosen to reflect possible factors that may be related to noise induced hearing loss among construction workers. Dependent variable was identified as hearing loss and independent variables were grouped under socio demographic factors, family and personal history as well as occupational health and environment.

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Table 2 Variable Table for Factors related to Hearing loss

Types of variables	Description	Abbreviation	How measured
Dependent variables			
Hearing loss preservation	Exposure to high noise levels, listening to loud music, use of earphones	HLP	Categorised as Always(high)=1 Never (low)=2

Independent Variables			
Socio-demographic factors			
Age	25 to 65 years		25-35 = 1 35-45=2 45-55=3 55-65=4
Gender	Male /Female		Male =1 Female =2
Job description	Type of work done on construction site		General worker =1 Labourer=2
Location	Outdoor (open areas, roads) On site/closed sites	OD OS	OD =1 OS=2
Family or Genetic history of Hearing loss			
Family/Genetic History	a) I have relatives with hearing loss b) I have problems with hearing from childhood	FHL1 FHL2	Yes=1 No=2
	Personal history of Hearing loss		

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Personal history about hearing loss	a) How often do you clean your ears? b) How often do you experience headaches after working in noisy areas	PHL1 PHL2	Always (Yes)=1 Never (No)=2
	c) How often do family and friends complain about hearing?	PHL3	Always (Yes)=1 Never (No)=2
Belief about hearing loss	a) Do you belief that the use of heavy machinery can result in hearing loss b) Do you belief that the use of earplugs can protect against hearing loss	BHL1 BHL2	Always (Yes)=1 Never (No)=2
Attitude about Hearing Loss			
Attitude about hearing loss	a) Do you constantly use earplugs when working in a high noise area	AHL1	Agree (Yes)=1 Disagree (No)=2
	b) I am always working in an extremely noisy area	AHL2	Agree (Yes)=1 Disagree (No)=2
Occupational health and environment	a) Do you always work with heavy machinery? b) Are noise levels monitored at work? c) Earplugs are replaced yearly	OHE1 OHE2 OHE3	Agree (Yes)=1 Disagree (No)=2

Dependent variable identified was hearing loss; factors that can contribute to this variable in the work environment (noise level exposure), as well as individual lifestyle, were considered. Independent variables were identified under socio-demographic; age, gender, job description and location family/genetic history that can give insight into pre-existing medical condition as well as personal history, belief and attitude about hearing loss that may contribute to the risk of exposure, lastly occupational health and environmental variables were considered to shed light on possible work practises that may increase the risk of noise exposure.

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3.12 Sources of Data

Sources used to obtain data for research study included primary, secondary and electronic sources. Quantitative data was extracted to answer identified research questions, information collected during the study as well as the use of available medical information that had been previously collated relating to the hearing ability or status of the employees involved in the study. The primary date was collected using questionnaires that were administered to construction workers within the gaiting region that met the criteria of the study. Private secondary data was used in the form of audiometry results from hearing test and occupational medical records of identified construction workers which were available in their employer's human resources database.

3.13 Instrumentation

A structured questionnaire was used as the data collection instrument with (N= 28), 3 sections (Appendix 4).

Section A focused on socio-demographic questions such as age, gender, marital status and occupation.

Section B aimed at determining the presence of the family and personal history of hearing loss.

Section C targeted occupational history, health and environment that may impact on hearing loss.

Data extraction form used to extract information from audio reports and other medical-related records (N=5). this allowed for consistency and easy extraction via the statistical analysis on SPSS. Respondents were interviewed directly to ensure clarity and avoid misunderstanding

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3.14 Data Collection Methods

The data collection methods selected for the study was questionnaire administered in-person to study participants who then completed it, the researcher was available to provide clarity and answer questions. Data from records enabled collection of occupational health information on participants which facilitated the identification of factors impacting on hearing loss in construction workers. Structure questionnaire was developed using mixed methods questions, validity and reliability were ensured by structuring clear, unambiguous questions targeting the eliciting of facts, objective and subjective data from respondents. Medical history and occupational records of respondents were used to determine pre-existing conditions, congenital abnormalities and other factors that may act as confounders in the study.

The selection of these methods allowed for unit measurements associated with noise levels decibels as well as give boundaries within the variables in the quantitative study. Furthermore, the identification of factors related to hearing loss was possible when information and statistics derived from response were used in combination with occupational records

3.15 Pilot Study

The pilot study was conducted using a building site in Groenkloof Gauteng, and permission was obtained from the site manager by explaining the purpose of the study and assuring that confidentiality will be maintained as the questionnaires did not require names. There were10 questionnaires that were handed out to randomly selected participants on-site. All 10 respondents returned their questionnaire.

It was a challenge to be allowed access to the site because of the occupational health requirements that needed to be complied with. The researcher was required to attend an induction before she could have access to the construction site. Secondly, workers were reluctant to leave their job and respond to questionnaires, it took a while to convince them, and some were asking if they will be compensated for participating.

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3.16 Summary of Pilot Study

A pilot study was done on the 14th of January on a construction site in Groenkloof Gauteng. However, 10 questionnaires were distributed, it took about 5 to 10 minutes for each respondent to complete the information depending on the level of education, in some instance, respondent asked for clarity on some questions**.** The major challenge was that of accessibility to the site, the solution identified is to give enough notice before the actual survey is conducted as to gain the better cooperation of Site Manager and workers alike

Socio-demographic -the section was well received, and respondents did not perceive the questions as being too personal. However, there were queries about the race, indicating that the options were not exhaustive enough. The occupational question was also perceived as not fully exhaustive.
Other sections of the questionnaire were well received.

3.17 Reliability and Validity

The pilot study was done on the 14th January 2020 on a construction site in Groenkloof area of Pretoria. However, 10 questionnaires were distributed, it took about 5 to 10 minutes for each respondent to complete the information depending on the level of education, in some instance, respondent asked for clarity on some questions. The major challenge was that of accessibility to the site, the solution identified is to give enough notice before the actual survey is conducted to gain the better co-operation of Site Manager and workers alike.

The questionnaire was developed after in-depth literature reviews and focus on the research objectives; adjustments were made in line with feedback from the pilot study, it was also compared with other instruments that have been validated through research. Face, content and criterion validity, as well as reliability, was ascertained by a research supervisor to ensure that the instrument had questions that link to each element being measured (Brink et al., 2012).

3.17.1 Reliability

A pilot study was conducted which was used to compare actual study to determine if the same response was gotten for the same participants, a test re-test was done during the pilot to ensure reliability of the tool further (Ehrlich, & Joubert, 2017). Internal reliability is ensured as all items are structured to measure variables in the study, accurate calculations and data cumulation was ensured to increase reliability, confidence intervals were used to determine the reliability of the information analysed (Brink, Van Der Walt, & Van Rensberg, 2012).

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Reliability of the instrument was assessed by checking each question response from the 10 participants, and it was identified that the instrument is reliable as the response given where consistent. For example, question 7 on the location of work was interpreted as the environment in which work was performed and was answered as such by all respondents.

3.17.2 Validity

The validity of the instrument was tested by assessing the overall response and determining if it measures the socio-demographic, family, medical history, occupational history and exposure to noise levels as intended by the study.

Face validity was ascertained as the instrument had questions that link to each element being measured. Construct validity was ascertained as the tool was designed to measure factors contributing to hearing loss among construction worker; these constructs was measured by the instrument. An examination of the instrument did not indicate any other construct except that of hearing loss.

Predictive validity was met by the instrument as respondent data collected gives an indication of the probability of some of the respondent engaging in behaviour that can promote or deter their hearing abilities in the future. An example is a question 11-do you listen to loud music, a respondent that answer yes can be predicted as being prone to some level of hearing loss in the future and may not protect themselves from loud noise levels at work as they are used to loud noise outside the work environment

3.18 Data Analysis

Bivariate analysis was used to determine the association between noise levels and hearing loss among construction workers, Statistical package for social sciences (SPSS)version 26 was used to analyse data collected from completed questionnaires; coding was used for easy analysis and data were presented in frequency tables and bar charts, using various software and consulting with research specialist and supervisors, findings are discussed in chapter four. (Sullivan, 2012).

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Objective 1: To quantify the levels of noise among construction workers in Midrand Gauteng province, South Africa

The relationship between hearing loss and noise levels was quantified by gathering field data on noise levels on construction sites and using occupational health records of participants to determine the impact on hearing. The strength of association was determined by using logistic regression analysis; while descriptive analysis was used to determine whether there is a significant difference between the expected frequency and the observed frequencies in this category.

Objective 2: To examine the relationship between hearing loss among construction workers and socio-demographic factors in Midrand Gauteng South Africa

Data examining the relationship between hearing loss and socio-demographic factors were analysed using multinomial regression with hearing loss as the dependant variable. The regression model indicated which aspects of socio-demographic characteristics significantly predict hearing loss.

Objective 3: To identify occupational factors contributing to hearing loss among construction workers in Midrand Gauteng South Africa

Data examining occupational factors related to hearing loss was analysed, construes that were measured included availability of earplugs/muffs, use of ear protection and quality of ear protection—the analysis allowed for regression against adjusted socio-demographic factors.

Objective 4: To identify health-related factors contributing to hearing loss among construction workers in Midrand Gauteng Province, South Africa

Relationship between hearing loss and health status was gathered by questionnaires to determine common health status that may impact on hearing loss. Logistic regression was used to determine the extent to which hearing loss (dependent variable) and health-related factors (presence of chronic disease) (independent variables) are correlated. Hearing loss was regressed against health-related factors.

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3.19 Ethical Consideration

The research was submitted to the University of Johannesburg, Faculty Academic Ethics Committee and Higher Degrees Committees for review and approval (Ethics certificate number REC261-2020)

Access to participants and document record

Construction companies where approached for access to their sites in Midrand, due to the large sample size (402) it was impossible to focus on one construction site, the researcher was then referred by the site managers to the appointed health and safety company in charge of the sites who was tasked with engaging with the researcher and ensuring that the study will not impact negatively on the companies

or their employees. A written application was then made to First Safety Solution to obtain approval to conduct a study on their sites in Midrand Gauteng and to review audiometry reports of the construction workers that participated in the study.

Obtaining informed consent

Informed consent is an ethical and legal requirement for research involving human participants. Participants were informed about aspects of the study which enabled them to make a decision on whether to the participant or not (Nijhawan, Janodia, Muddukrishna, Bhat, Bairy, Udupa, & Musmade, 2013). All participants were informed of the aim and objectives of the study, and permission was requested from construction workers by signing of informed consent forms. Midrand area in Gauteng is populated with different foreigners from all over Africa, and the prominent language of communication is English; thus, the information letter and questionnaire were in the English language.

Right to equity, human dignity and protection against harm

All participants that meet the inclusion criteria were classified as construction workers, and there was no grading of participants according to age or gender. Participants were not exposed to any form of harm in this research and took approximately 40 minutes to complete the interview.

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Right to anonymity, confidentiality and privacy

The self- administered questionnaire was completed on an individual anonymous basis to allow the participants to express themselves freely; the questionnaire did not require names or identification number to maintain anonymity. Each site was given a project-specific code to allow for responses and findings from the sites to be handled confidentially by the researcher. Such responses and findings were not disclosed to other participants, site supervisors /or to management singularly as the aim was not to expose the health status of the workers. Hearing status was not disclosed to anyone except members of the research team, i.e. researcher and supervisors. The questionnaires and information obtained from the document review were stored under lock and key and will be kept for five years after which it will be destroyed. All data collected during the research were stored securely, and only the researcher, the supervisor had access to it. (Nijhawan et al., 2013).

Right to freedom of choice

An information letter was used to inform all participants of their right to withdraw at any time during the study and that they may have access to the information collected during the research through the management structure of First safety solutions.

Right to community and community science

The participants may access any information about this research and the results of this research through the management of First safety solutions following the completion of the study. Possible dissemination of research findings includes presentations at key meetings, conferences and publications in sources likely to be accessed by the targeted audience. If any problems exist, that pose a threat to human health, and it shall be reported to the management of First safety solutions.

3.20 Summary

The methodology chosen for the study was appropriate, the benefits outweighed the drawbacks and allowed for a process of identification, selection and proper ethical data collection that lead to data . analysis of information relating to the study.

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CHAPTER 4: RESULTS

4.1 Introduction

This chapter outline the findings and statistical analysis for factors relating to hearing loss among construction workers in Midrand Guateng. Research findings are presented from data collected during the study. Primary data was collected using a questionnaire, and secondary data was collected from occupational health records of participants. The findings will be presented based on the research questions outlined in the study. The data was analysed to identify factors that may be related to hearing loss among construction workers in Midrand Gauteng, 600 questionnaires were distributed, and 400 total respondents that met the inclusion criteria were used for the study.

The questionnaire comprises of three sections and data generated will be presented as follows;

• Section A focused on socio-demographic information of participants such as age, gender, ethnicity, occupation, educational qualification and occupational duty location • Section B focused on family and personal history of participants regarding hearing ability or disability, and this data was correlated against hearing loss and adjusted for demographic data • Section C focused on occupational history, health and environment of participants and will be examined to determine occupational factors that relate to hearing loss of construction workers.

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4.2 Objectives

1. To quantify the levels of noise among construction workers in Midrand Gauteng province, South Africa
2. To examine the relationship between hearing loss among construction workers and socio-demographic factors in Midrand Gauteng South Africa
3. To identify occupational factors contributing to hearing loss among construction workers in Midrand Gauteng South Africa
4. To identify health-related factors contributing to hearing loss among construction workers in Midrand Gauteng Province, South Africa

4.3 Descriptive Analysis Report

Descriptive statistical analysis was used to determine frequencies and percentages for all variables in the questionnaire. All respondents answered all the questions, so the percentage reported

corresponds to the total number of responses received per questionnaire. Statistical significance of relationships among variables was determined using the crude odds ratio and adjusted odds ratio for selected variables at 95% confidence intervals. This section consists of data analysis from socio demographic information of participants and its relations to hearing loss among construction workers in Midrand Gauteng

4.3.1 Social demographic factors related to hearing loss

The study seeks to determine the relationship between social demographic factors and hearing loss among construction workers in Midrand Gauteng using questions about age, gender, ethnicity and occupation. All respondents answered the various questions in this section, thus Table 4.1 below outlines frequency distribution by socio-demographic factors; the data consisted of age, gender, ethnicity, occupation, education and duty location. Total respondent n=400 (100%). While table 4.2 shows the statistical analysis for variables with statistical significance.

Table 4.1 Frequency table by socio-demographic factors for factors related to hearing loss among construction workers in Midrand Gauteng

	Total		Hearing loss		No hearing loss	
Characteristics	n	%	n	%	n	%
Total	400	100%	164	41%	236	59%
Age						
18 -25 years	25	6.3%	3	12%	22	88.0%
25 – 35 years	189	47.3%	69	36.5%	120	63.5%
35– 45 years	123	30.8%	59	48%	64	52.0%
45 years above	63	15.8%	33	52.2%	30	47.6%
Gender						
Male	376	94%	154	41%	222	59%
Female	24	6%	10	38.5%	14	58.3%
Ethnicity						
Black	336	84%	133	39.6%	203	60.4%
White	42	10.5%	17	40.5%	25	59.5%
Coloured/Indian	22	5.5%	14	63.6%	8	36.4%
Occupation						
General worker	387	96.8%	164	42.4%	223	57.6%
Labourer/rigger/carpenter	13	3.3%	0	0.0%	13	100%
Education						

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Grade12 below	334	83.5%	164	41%	236	59%
Post matric/Diploma	0	0%	0	0%	0	0%
Baccalaureate /post graduate Degree	0	0%	0	0%	0	0%
Duty Location						
Outdoors	354	88.5%	157	44.4%	197	55.6%
Closed /indoor sites	46	11.5%	7	15.2%	39	84.4%

The study set out to determine if there is any relationship between hearing loss among construction workers and socio-demographic factors; the data consisted of age, gender, ethnicity, occupation, education and duty location. Total respondent n=400 (100%). All participants responded to this question, with 47.3% within the age range of 25-35years (n=189 respondents), 35-45years having n=123 respondent at 30.8% as shown in the frequency table. All participants who responded to this question; respondents were mostly male with n=376 at 94% of which NHIL cases n= 154 (41%) and No NHIL cases n=222 (59%) while 24 female responded (6%) Participants were asked to indicate racial group by ticking among the option given on the questionnaire, respondents were predominantly black n=336 (84%) of which 39.6% were NHIL cases. Statistical analysis for socio-demographic variables crude and adjusted odds ratio at 95% confident interval against percentage hearing loss was done and outlined in table 4.2 below.

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Table 4.2 Crude odds ratio and adjusted odds ratio by demographic factors for hearing loss among construction workers in Midrand Gauteng

Characteristics	Crude Odds ratio	95% Confidence Intervals	Adjusted* Odds ratio	95% Confidence Intervals
Age				
18 -25 years	**0.24**	**0.07-0.82**	**0.09**	**0.02 - 0.34**
25 – 35 years	Reference	Reference	Reference	Reference
35– 45years	**1.60**	**1.01-2.50**	**0.41**	**0.22 - 0.76**
45 years above	**1.91**	**1.08-3.40**	0.74	0.39 – 1.40
Gender				
Male	0.97	**0.42-2.24**	1.03	0.42 -2.54
Female	Reference	Reference	Reference	Reference
Ethnicity				
Black	Reference	Reference	Reference	Reference
White	1.04	0.54 -1.99	0.22	0.08 - 0.61

Colored/Indian	2.67	1.09-6.54	0.32	0.10 – 1.04
Duty Location				
Outdoors	Reference	Reference	Reference	Reference
Closed /indoor sites	0.23	0.09-0.52	6.53	2.68 – 15.9

* Adjusted for age, gender, ethnicity, occupation, education and duty location

Binary logistic regression was used to analyse socio-demographic date, crude odds ratios and adjusted odds ratios were determined at 95% confidence intervals. The age group of 18-25 years was significant for both crude OR=0.24, 95%CI (0.07-0.82) and adjusted odds ratio (sociodemographic controlled against percentage hearing loss) OR= 0.09; 95% CI (0.02 – 0.34) given an indication that this age group may not have spent a lot of time in the construction industry enough to be affected by noise exposure and thus hearing loss. Statistical significance for working in closed sites/indoor sites may be a protective factor against hearing loss with OR= 0.23, 95%CI (0.09-0.52), the highest percentages of overexposed workers occur in highway and street construction, carpentry, and concrete work. Of the approximately 5 million construction workers in 1995, the total number exposed to noise levels of 85 dB and above was about 754,000.
Suter. (2002). This section consists of data analysis from family and personal history of participants and its relations to hearing loss among construction workers in Midrand Gauteng.

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4.3.2 Family and personal history of hearing ability or disability

The study seeks to determine the relationship between health-related factors and hearing loss among construction workers in Midrand Gauteng using questions about family and health history as well as personal health habits. All respondents answered the various questions in this section thus Table 4.3 below present frequency distribution for the relationship between family, personal history and hearing loss among construction workers N=400(100%) while table 4.4 shows the statistical analysis done for the same variables adjusted for age, gender, ethnicity, occupation, education and duty location.

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Table 4.3 Frequency distribution by family and personal history for factors related to hearing loss among construction workers in Midrand Gauteng

	Total		Hearing loss		No hearing loss	
Characteristics	n	%	n	%	n	%
Total	400	100%	164	41%	236	59%
Childhood history						
Yes	6	1.5%	3	50%	3	50%
No	394	98.5%	161	40.9%	233	59.1%
Relative with hearing loss						
Yes	21	5.3%	7	33.3%	14	66.7%
No	379	94.8%	157	41.4%	2.22	58.6%
Injury to ear						
Yes	3	.8%	1	33.3%	2	66.7%
No	396	99.2%	163	41.2%	233	58.8%
Earphones to listen to music						
Always	54	13.5%	8	14.8%	46	85.2%
Never	346	86.5%	156	45.1%	190	54.9%
Listen to loud music						
Always	51	12.8%	5	9.8%	46	90.2%
Never	349	87.3%	159	45.6%	190	54.4%
Uses earplugs at work						
Always	393	98.3%	164	41.7%	229	58.3%
Never	7	1.8%	0	0.0%	7	100%
Clean ear						
Always	105	26.3%	53	50.5%	52	49.5%
Never	295	73.8%	111	37.6%	184	62.4%
Experience headaches						
Always	101	25.3%	33	32.7%	68	67.3%
Never	299	74.8%	131	43.8%	168	56.2%
Experience ringing in ears						
Always	16	4.0%	10	62.5%	6	37.5%
Never	384	96%	154	40.1%	230	59.9%
Family complains about hearing						
Always	17	4.3%	9	52.9%	8	47.1%
Never	383	95.8%	155	40.5%	228	59.5%
Turn TV volume up						

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Always	19	4.8%	8	42.1%	11	57.9%
Never	381	95.3%	156	40.9%	225	59.1%
Smoking						
Yes	195	48.8%	75	38.5%	120	61.5%
No/Quit	205	51.2%	89	43.4%	116	56.6%
Chemical exposure						
Yes	10	2.5%	5	50%	5	50%
No	390	97.5%	159	40.8%	231	59.2%
Perception of hearing ability						
Certain no hearing loss	220	55.0%	34	15.5%	186	84.5%
Certain I have hearing loss	3	.8%	2	66.7%	1	33.3%
Uncertain, not sure/suspicious	177	44.3%	128	72.3%	49	27.7%
Chronic disease						
Yes	43	10.8%	17	39.5%	26	60.5%
No	35.7	89.3%	147	41.2%	210	58.8%
Years living with chronic						
2-4years	356	89%	147	41.3%	209	58.7%
5 above	20	5.0%	9	45%	11	55%
Non	24	6.0%	8	33.3%	16	66.7%

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Respondents were asked questions about childhood history of hearing problems n= 6 (1.5%) responded yes. Of the 6, n=3 (50%) was part of the exposed cases, respondents who indicated having relatives with hearing loss n=21 (5.3%) while n= 3(.8%) respondent indicated having had a form of injury to ear with 33.3% (n=1) been part of the hearing loss group. Respondents were asked a question about the use of earphones when listening to music, n= 51 (12.8%) indicated they use of earphones always of that n=8 (14.8%) formed part of the hearing loss group. N= 349 (86.5%) indicated they have never used earphones, n= 156(45.1%) of which was found in the hearing loss group. Regarding the question of listening to loud music, n =51 (12.8%) of respondents always answered while n=349(87.3%) answered never.

A total of 393(98.3%) respondents indicated that they always use earplugs at work, 164(41.7%) of this belongs in the hearing loss group while 229(58.3%) in No hearing loss. 40.1% of the

respondent (n=154) with hearing loss do not experience ringing in the ear, (n=128) 72.3 % of those with hearing loss had a suspicion about their hearing disability. Respondents with chronic disease n= 44 (10.8%) of which n=24 has had the chronic disease for five years above and those without chronic disease n=357 (89.3%). Statistical analysis was done for family and personal history adjusted for age, gender, ethnicity, occupation, education and duty location as outlined in table 4.4 below.

Table 4.4: Crude odds ratio and adjusted odds ratio by family and personal history for factors related to hearing loss among construction workers in Midrand Gauteng

Characteristics	Crude Odds ratio	95% Confidence Intervals	*Adjusted Odds ratio	95% Confidence Intervals
Childhood history				
Yes	1.45	0.29-7.26	0.29	0.05 – 1.89
No	Reference	Reference	Reference	Reference
Relative with hearing loss				
Yes	0.71	0.28-1.79	1.98	0.67 – 5.80
No	Reference	Reference	Reference	Reference
Injury to ear				
Yes	0.71	0.06-7.90	0.28	0.02 – 3.52
No	Reference	Reference	Reference	Reference
Earphones to listen to music				
Always	0.21	0.09-0.46	3.35	1.46 – 7.66
Never	Reference	Reference	Reference	Reference
Listen to loud music				
Always	0.13	0.05-0.33	6.04	2.25 – 16.3
Never	Reference	Reference	Reference	Reference
Clean ear				
Always	1.69	1.08-2.65	0.59	0.37 - 0.96
Never	Reference	Reference	Reference	Reference
Experience headaches				
Always	0.62	0.39-1.00	1.60	0.97 – 2.68
Never	Reference	Reference	Reference	Reference
Experience ringing in ears				
Always	2.5	0.89-6.9	0.25	0.08 - 0.75
Never	Reference	Reference	Reference	Reference
Family complains about hearing				
Always	1.65	0.62-4.38	0.45	0.16 – 1.26

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Never	Reference	Reference	Reference	Reference
Turn TV volume up				
Always	1.05	0.41-2.67	0.87	0.33 – 2.28
Never	Reference	Reference	Reference	Reference
Smoking				
Yes	0.81	0.55-1.21	1.25	0.79 – 1.95
No/Quit	Reference	Reference	Reference	Reference
Chemical exposure				
Yes	1.45	0.41-5.1	0.14	0.03 - 0.79
No	Reference	Reference	Reference	Reference
Perception of hearing ability				
Certain no hearing loss	0.07	0.04-0.11	0.07	0.04 - 0.13
Certain I have hearing loss	0.77	0.07-8.6	2.31	0.16 – 32.6
Uncertain, not sure/suspicious	Reference	Reference	Reference	Reference
Chronic disease				
Yes	0.93	0.48-1.8	0.66	0.31 – 1.39
No	Reference	Reference	Reference	Reference
Years living with chronic				
2-4years	Reference	Reference	Reference	Reference
5 above	1.16	0.47-2.90	2.56	0.92 -7.18
Non	0.71	0.29-1.70	2.60	0.68 – 9.93

***** Adjusted for age, gender, ethnicity, occupation, education and duty location

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Childhood history of a hearing problem was likely to pre-dispose construction workers in Midrand Gauteng to hearing loss with OR=1.45; 95% CI (0.29 -7.26), other risk factors that impacting on hearing loss are workers who clean ears always OR=1.69; 95% CI (1.08 -2.65), workers experiencing ringing in ears OR=2.5; 95% CI (0.89 -6.9). Workers with a history of the family complaining about hearing also have a predisposition to hearing loss OR=1.65; 95%CI (0.62-4.38), although having a chronic disease is not associated with hearing loss, length of chronic illness above 5years is significant with OR=1.16; 95%CI (0.47 - 2.90).This section consists of data analysis from occupational history, health and environment of participants and its relations to hearing loss among construction workers in Midrand Gauteng

4.3.3 Occupational history, health and environment

The final section of the questionnaire seeks to elicit responses that will provide information on participant's work exposure that impacts on hearing loss, total respondents n=400 (100%) gave answers to all the questions in this section. The secondary data here were collected from respondent's occupational health records; the current audiometry reports were used in all cases and information extracted after specific numbers were allocated to respondents to maintain confidentiality and anonymity, Table 4.5 shows the frequency distribution for occupational health and environmental history of respondents with a focus on types of equipment used, years of working in construction and use of protective devices, while table 4.6 outlines statistical analysis done for same variables adjusted for age, gender, ethnicity, occupation, education and duty location

Table 4.5: Frequency of occupational health and environmental history for factors related to hearing loss among construction workers in Midrand Gauteng

	Total		**Hearing loss**		**No hearing loss**	
Characteristics	n	%	n	%	n	%
Total	400	100%	164	41%	236	59%
Incident of chemical exposure						
Yes	1	.3%	0	0%	1	100%
No	399	99.8%	164	41.1%	235	58.9%
Years working in construction						
2-4years	88	22.0%	19	21.6%	69	78.4%
5-7years	138	34.5%	57	41.3%	81	58.7%
7years above	174	43.5%	88	50.6%	86	49.4%
Hearing test is done						
Yes	400	100%	164	41%	236	59%
No	0	0%	0	0%	0	0%
Yearly hearing test						
Agree	380	95%	163	42.9%	217	57.1%
disagree	20	5.0%	1	5.0%	19	95%
Earplugs provided at work						
Agree	390	97.5%	164	42.1%	226	57.9%
disagree	10	2.5%	0	0%	10	100%
Uses earplugs always in a noisy area						
agree	384	96%	164	42.7%	220	57.3%
disagree	16	4.0%	0	0%	16	100%

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Use drillers at work						
Agree	277	69.3%	138	49.8%	139	50.2%
disagree	123	30.8%	26	21.1%	97	78.9%
Use chainsaw at work						
Agree	127	31.8%	63	49.6%	64	50.4%
disagree	273	68.3%	101	37%	172	63.0%
Use jackhammer at work						
Agree	169	42.3%	91	53.8%	78	46.2%
disagree	231	57.8%	73	31.6%	158	68.4%
Use chop saw at work						
Agree	39	9.8%	31	79.5%	8	20.5%
disagree	361	90.3%	133	36.8%	228	63.2%
Always work in an extremely noisy area						
Agree	394	98.5%	163	41.4%	231	58.6%
disagree	6	1.5%	1	16.7%	5	83.3%
Noise levels are monitored at work						
Agree	27	6.8%	12	44.4%	15	55.6%
disagree	373	93.3%	152	40.8%	221	59.2%
Earplugs reduce noise intensity						
Always	311	77.8%	138	44.4%	173	55.6%
Never	89	22.3%	26	29.2%	63	70.8%
Earplugs are replaced yearly						
Always	168	42.0%	0	0%	168	100%
Never	232	58%	164	70.7%	68	29.3%
Percentage hearing loss						
1-11(no hearing loss)	236	59%	0	0%	236	59%
12 above (hearing loss)	164	41%	164	41%	0%	0%
Ear impairment						
Left hearing	70	34.8%	46	65.7%	24	34.3%

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Right hearing	42	18.4%	30	67.6%	12	32.4%
Both	94	46.8%	88	93.6%	6	6.4%
The intensity of hearing loss						
Mild	64	35.2%	22	28.6%	42	71.4%
Moderate	70	32.0%	70	100%	0	0%
Severe	72	32.9%	72	100%	0	0%

Respondents were asked about any incident of chemical exposures at work, N= 399 (99.8%) indicated not having any exposure, in regards to the question on years of working in the construction industry n= 174 (43.5%) indicated having worked for 7years and above, of this percentage, 50.6 % (n=88) were among the hearing loss group , followed by 5-7years with n=138 (34.5%) of which 41.3% (n= 57) had NIHL condition, respondents with 4 years below n= 88 (22%) recorded less noise induced hearing loss cases n=19(21.6%). All respondents had baseline hearing test done in line with the inclusion criteria n=400 (100%), a yearly hearing test is done n= 380 (95%) and year plugs provided at work n=390 (97.5%).

Respondents were asked question regarding equipment use in the work environment, use of drills n= 277 (69.3%) of which n=138 (49.8%) were among the NIHL group and n= 139 (50.2%) for No NIHL group. Use of jackhammer n=169 (42.3%) of which n=91 (53.8%) had NIHL condition and n= 78 (46.2%) had No NIHL.98.5% (n= 394) respondents agreed to always working in extreme noisy area, while n= 373 (93.3%) indicated that noise levels were not monitored at work. Audiometry reports of respondents were accessed n=400 (100%); percentage hearing loss was used to determine presence or absence of disease condition n=164 (41%) NIHL cases with n=236 (59%) No NIHL. Information regarding intensity of hearing loss indicates, mild n= 64 (35.2%) of which NIHL cases are 22(28.6%) and No NIHL cases,n=42 (71.4%), moderate n=70 (32%), severe n= 72 (32.9%).

Figure 4 shows classification for un-exposed (no hearing loss 1) and exposed cases (hearing loss 2) using percentage hearing loss for respondents

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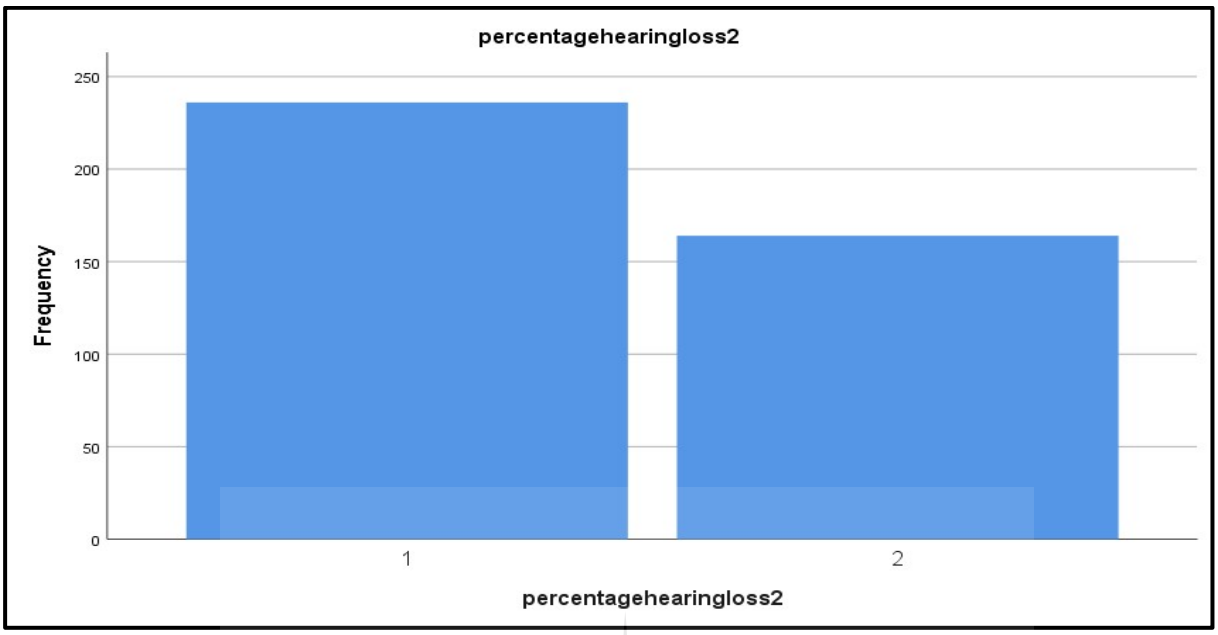

Figure 4 Bar chart frequency of percentage hearing loss among construction workers in Midrand Gauteng

No hearing loss frequency was high, with 236 respondents and noise induced hearing loss frequency at 164.

Figure 5 shows the frequency for hearing loss intensity in NIHL condition, respondents classified as mild (1) N=64, moderate (2)N=70and severe (3)N=72

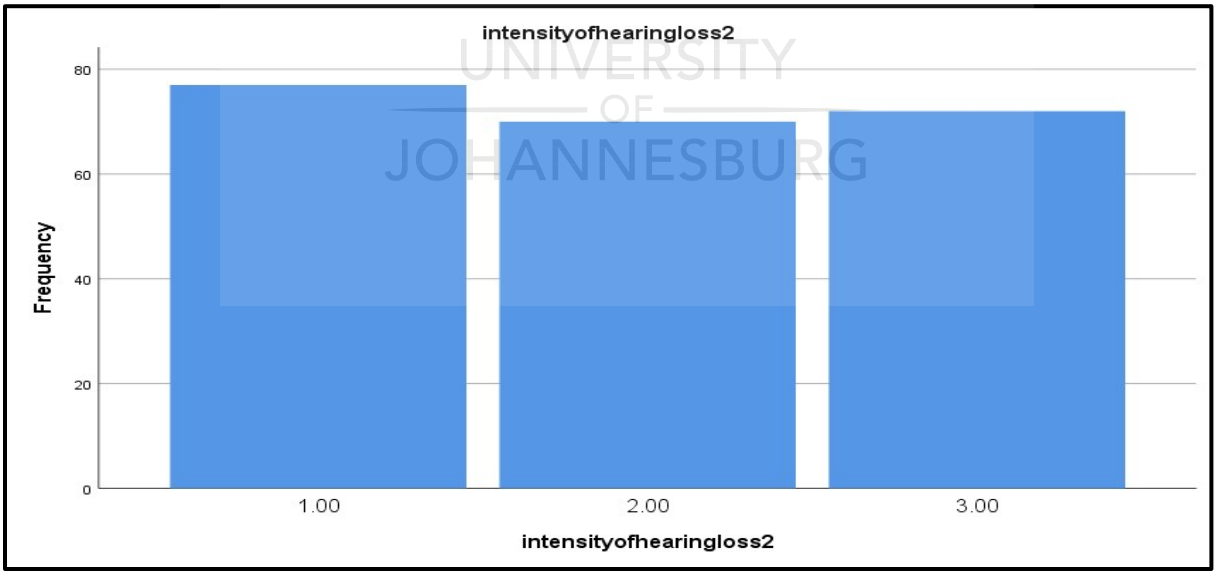

Figure 5 Bar chart frequency of intensity of hearing loss among construction workers in Midrand Gauteng

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The highest frequency was respondents with severe hearing loss at 72, while the moderate hearing loss was 70 and mild hearing loss 64.

Statistical analysis done for occupational health and environment crude and adjusted ratio at 95% confidence intervals outlined in table 4.6.

Table 4.6 Crude odds ratio and adjusted odd ration of occupational history, health and environment for factors related to hearing loss among construction workers in Midrand Gauteng

	Crude Odds ratio	95% Confidence Intervals	*Adjusted Odds ratio	95% Confidence Intervals
Years working in construction				
2-4years	0.27	0.15-0.48	0.38	0.17 -0.86
5-7years	0.69	0.44-1.0	0.69	0.38 – 1.28
7years above	Reference	Reference	Reference	Reference
Yearly hearing test				
Agree	Reference	Reference	Reference	Reference
disagree	0.07	0.01-0.5	9.00	1.16 – 69.8
Use drillers at work				
Agree	Reference	Reference	Reference	Reference
disagree	0.27	0.16-0.44	0.26	0.14 - .50
Use chainsaw at work				
Agree	Reference	Reference	Reference	Reference
disagree	0.59	0.39-0.9	0.75	0.45 – 1.24
Use jackhammer at work				
Agree	Reference	Reference	Reference	Reference
disagree	0.39	0.26-0.59	0.47	.29 - .76
Use chop saw at work				
Agree	Reference	Reference	Reference	Reference
disagree	0.15	0.06-0.33	0.20	0.09 - 0.48
Always work in an extremely noisy area				
Agree	Reference	Reference	Reference	Reference
disagree	0.28	0.03-2.4	0.69	0.07 – 7.4
Earplugs reduce noise intensity				
Always	Reference	Reference	Reference	Reference
Never	0.51	0.3-0.9	0.72	0.42 – 1.24
Percentage hearing loss				

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1-11 (no hearing loss)	Reference	Reference	Reference	Reference
12 above (hearing loss	1.0	0.75-1.3		
Ear impairment				
Left hearing	0.13	0.04-0.34	0.11	0.04 - 0.31
Right hearing	0.14	0.04-0.41	0.12	0.04 -0.37
Both	Reference	Reference	Reference	Reference

*Adjusted for age, gender, ethnicity, occupation, education and duty location

The table for occupational history, health and environmental factor showed significant findings between years of working in the construction industry and hearing loss, workers that have worked for 4years below have a protective relation to hearing loss with OR=0.27; 95% CI (0.15 -0.48) remains significant for the adjusted odds ratio. Use of equipment also gave significant protective findings; workers who have not worked with heavy equipment are likely to be protected from hearing loss. Drills not used OR=0.27 ;95% CI (0.16 – 0.44), chainsaw not used OR 0.59 95% CI (0.39 -0.9) and jackhammer not used OR=0.39; 95%CI (0.26-0.59). Workers who indicated that they hardly work in a noisy area are less likely to have hearing loss OR=0.51; 95%CI (0.3-0.9)

Summary

Data analysis methods and study results have been outlined above. The findings of the study are consistent with findings from other related studies on hearing loss among construction workers, furthermore factors related to hearing loss such as socio-demographic, family, personal, occupational and environmental factors were explored. Data findings were correlated with study variables and presented in tables. In chapter five, the implications of the findings for constructions workers, the construction industry and for occupational health will be discussed as well as the study limitation presented.

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CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter outlines discussion on findings in relation to other literature as well as recommendations. In this chapter a discussion on the findings outlined in chapter four will be done about sociodemographic, family, occupational health and environmental factors that are significant to the study; factors related to hearing loss among construction workers in Midrand Gauteng. Certain strength and limitations of the study identified will be discussed.

5.2 Discussion on findings

5.2.1. Sociodemographic factors and NIHL

The study set out to determine if there is any relationship between hearing loss among construction workers and socio-demographic factors; the data consisted of age, gender, ethnicity, occupation, education and duty location. Respondents were mostly male with n=376 at 94% this finding is supported by (Sang, &Powell, 2012) which submitted that the construction industry remains one of the most male-dominated sectors, the reason for this may be the fact that different tasks required are labour intensive, requiring long hours in the open weather and operation of heavy machinery.

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Age distribution indicates 25-35years as the predominant age with 47.3%, followed by 35-45 years (30.8%), Akindele, Mehlape, Valoyi, & Talukhaba.[n.d] submitted that the age distribution for construction workers interviewed was 18years youngest and 65years oldest; cross-section of statistics in 2019 shows construction workers age range from 25-65years with median age been 42.6 years (U.S Bureau of labour statistics,2019) .88.5% worked outdoors in comparison to 11.5 % that worked in closed sites/indoors. Workers within the age range of 18-25 years indicated statistical significance for this age range protected against hearing loss as well as workers who worked on closed sites and indoors, these findings are in line with related literature on the effect of outdoor work on construction workers. However, analysis of the adjusted ratio did not give sufficient evidence of statistical significance; this may be due to the low number of the sample size used in the study.

Age of workers has a direct link with the years that workers have been on construction sites; as a result, the lower age range enjoys protection against hearing loss about the age range of 35 above. Participants were asked to indicate racial group by ticking among the option given on the questionnaire; respondents were predominantly black (84%) of which 39.6% were exposed. The prominent reason for employing immigrants is that South African employers tend to prefer immigrant workers, who are considered hard-working, excellent workers, more disciplined and well-behaved (Crush &Williams,2001). These migrant workers, primarily Mozambicans, are recruited by labour brokers in Gauteng and the City of Cape Town, for long-distance migrant labour in the city's booming construction industry (Crush& Williams, 2001).

Participants were asked to indicate what their task is within the construction industry as well as where this task is performed in terms of location, majority of respondents indicated working as general workers, outdoors and having educational qualification below grade 12. Crush &Williams. (2001) states that the construction industry, originally the preserve of Zimbabweans, is increasingly dominated by illegal Mozambicans recruited in South Africa as casual labourers which supports that findings stated above. Based on this study gender and ethnicity does not seems to have any association with hearing loss as no statistically significant findings were identified, however worker's duty location and age may be associated with hearing loss among construction workers in Midrand Gauteng.

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5.2.2 Occupational health, environmental factors and NIHL

5.2.2.1 Noise levels on construction sites

Respondents were asked question regarding equipment used in the work environment, for construction workers, most of the equipment they use regularly is above the 85 decibels exposure level: Jackhammer: 100 decibels, Chop saw: 105 decibels, Chain saw: 110 decibels, Hammer drill: 115decibels. Thus, it can be concluded that one of the major factor contributing to hearing loss among this group is exposed to high noise levels for extensive periods (Dement et al., 2018)

The findings of the study revealed that construction workers in Midrand Gauteng are exposed to noise levels that range within 85 to 90 decibels when they are not working with heavy machinery and increases to 95 -110 decibels when jackhammers, drillers and chainsaw are in use,

Kantova.(2017) supports this finding. The main sources of noise at a construction site include construction machines (mainly machines which produce impacts, e.g. devices for breaking concrete), earthmoving machines, pile drivers, pneumatically driven devices and combustion engines.

Statistical analysis for workers who did not use the equipment listed above was significant for workers who indicated not using drillers, jackhammer and chop saw at work indicating that the factor was maybe protective against hearing loss. The other factor considered for this objective is the perception of workers on noise levels exposed to at work, respondents who indicated that they were not always working in extreme noisy area statistical analysis showed insufficient evidence of statistically significant indicating there is no difference between the NIHL group and the No hearing loss group . Thus it may be safe to conclude that all construction workers are always working in an extremely noisy area. The average noise level of the general population in Gauteng area is estimated at 60 decibels in 24 hours (Tshwane Noise management), construction work hours is 10hours within which workers are exposed to varying noise levels ranging from 80-110 decibels, it is therefore evident that the levels of noise among construction workers in Midrand Gauteng are higher than the general population in South Africa.

5.2.2.2 Other Occupational factors

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Respondents were asked about any incident of chemical exposures at work (99.8%) indicated not having any exposure, in regard to the question on years of working in the construction industry (43.5%) indicated having worked for 7years. Above, of this percentage, 50.6 % were among the NIHL group, followed by 5-7years (34.5%) of which 41.3% had NIHL, respondents with 4 years below (22%) recorded less NIHL cases (21.6%). Long-term exposure to daily noise levels above the lower action level of 80 decibels may eventually cause noise-induced hearing loss (Leensen, van Duivenbooden, &Dreschler, 2011). The findings for occupational health factors for the study indicates that years of working in the construction industry may have an impact on exposure, the longer workers have been on sites, the more exposed they are and the intensity of hearing loss also increases (from mild to moderate/severe). Statistical analysis for this factor was significant for workers who worked in the construction industry for 4years and below indicating that this factor is protected against hearing loss. A proportion of 98.5% of respondents agreed to always work in an extremely noisy area, while 93.3% indicate that noise levels were not monitored at work. Noise

exposed workers had greater hearing losses compared to their non-noise-exposed colleagues, and to the reference, population reported in ISO-1999 (Leensen, van Duivenbooden, & Dreschler, 2011). The noise levels from the use of this heavy machineries are well documented. They have been discussed and highlighted throughout the study, thus supporting the submission that a critical occupational health factor is noise levels that are above 80 decibels on the sites.

Audiometry reports of respondents were accessed n=400 (100%); percentage hearing loss was used to determine presence of disease condition, (41%) NIHL cases with (59%) No NIHL cases. Information regarding the intensity of hearing loss indicates mild (35.2%) of which NIHL group are (28.6%), moderate (32%), severe (32.9%), it is interesting to see that of the n=236 No hearing loss group n=42 had mild levels of hearing loss that may be categorised as the early onset. This finding is supported by (Pelegrin, Canuet, Rodríguez, & Morales, 2015) NIHL has an insidious onset. It may be well advanced by the time that it gives rise to considerable disability. Pure-tone audiometric testing is used to detect and quantify the degree of NIHL. This provides an objective measure of hearing impairment in individuals exposed to occupational noise. Self-report hearing problems and a physical examination are sometimes used for detection of NIHL at the workplace. However, hearing complaints do not always seem to be associated with early hearing impairment. Besides, although auditory or vestibular symptoms such as tinnitus and vertigo are thought to be related to early NIHL, these symptoms often represent a heterogeneous group of underlying disorders.

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Furthermore, long-term exposure to noise may cause vestibular symptoms before clinically detectable hearing loss occurs. However, the symptoms are subtle and mostly neglected and do not affect the functional ability of workers. Thus, the use of audiometric testing is of great value for early diagnosis of occupational hearing loss, especially in high-noise environments. From the above analysis, occupational factors that are associated with hearing loss are the use of heavy machinery, years of working in the construction industry and exposure to high noise levels for extended hours.

5.2.3 Family, personal factors and NIHL

71% of respondents recorded no hearing loss. In comparison, 29.2% reported hearing loss ranging from moderate to severe.33.3% of the NIHL group had a history of childhood hearing disease with 23.8% family history of hearing loss.27.9% of the NIHL group has been diagnosed with the chronic disease while 77.3% of the No hearing loss group has a chronic disease, smoking habits are also reduced in the noise induced hearing loss group (26.7%) compared to the No NIHL group 73.3%. The findings for health-related factors indicated that chronic disease might not be associated with hearing loss; however, symptoms like ringing in ears and a history of chemical exposures are significant. Interestingly, findings in this study indicate insufficient evidence of statistical significance for smoking and chronic disease.

5.3 Strength of the study

The study identified various factors and challenges faced by the construction industry in protecting workers from noise exposures above 85db with resultant hearing loss, and this issue needs to be raised in light of the continual trend of hearing loss among workers in this specific industry. Scientific analysis was applied to produce valid and reliable reports that can be used to extend current literature and shed light on the industry challenges. The objective was clearly stated with inclusion and exclusion criteria, and the study used multiple data-based searches for literature review. All respondents answered all questions contained in the questionnaire thus, no missing data recorded for the study, as well as target sample size met. Data extraction and coding were supervised and approved by a statistician.

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5.4 Limitation of the study

Secondary data was used in the study because there was a need to consider the occupational health records of participants and possibility of hearing loss, cultural bias may affect the response from workers on health-related matters, and limited resources have restricted the study to just workers in a specific demographic region. Thus, future studies can be carried out in another geographic area to identify similar findings and pro offer interventions. More sample size may have benefited the study thus allowing for the use of varying statistical analysis, the time frame restriction of the data collection also posed a limitation on the study as well as financial constraints as the study was self-sponsored.

.5.5 Conclusion

The study was able to highlight factors related to hearing loss among construction workers Midrand in Gauteng; findings support literature review in terms of noise levels and exposure of workers resulting in hearing loss. It suggested that exposure of construction workers to high noise levels as a result of heavy machinery used and outdoor activities are a contributing factor to noise induced hearing loss, the use of earplugs as the major mitigating action has proved to be insufficient in reducing the incident of these occupational diseases, construction workers who have worked for over 3 years and above showed more susceptibility to noise induced hearing loss when compared to workers with fewer years of experience. Absence of noise monitoring on construction sites has contributed to uncontrolled exposure of workers to the noise level above 85 decibels for more than 8hours or more consistently. The need for hearing loss monitoring and subsequent referral for hearing conservation was highlighted by the study as some of the No hearing loss group indicate early signs of hearing loss that may still be reversible with the use of comprehensive hearing preservation programs.

5.5.1 Public health implications

"Hearing loss has been ranked as the fifth leading cause of years lived with disability in the Global Burden of Disease Study 2013, higher than many other chronic diseases such as diabetes, dementia, and chronic obstructive pulmonary disease. However, hearing loss receives limited research funding and public awareness". (Lancet. 2016) thus this study aimed to shade more light and bring attention to the disease in an occupational health setting. It seeks to contribute to the body of knowledge and extend current literature, thus giving information to public health practitioners that can assist in developing mitigating actions or further investigation into the disease. It is hoped that the study has shed light on factors related to hearing loss and prompt new questions that can drive changes in public health.

5.6 Recommendation

5.6.1 Further studies

Further study on factors related to hearing loss may be beneficial to the industry and effectiveness of earplugs in protecting against noise levels in the construction industry.

5.6.2 Public Health Implications

Policy change with more stringent penalties, monitoring and inspection of sites by health officers will increase compliance to legislation.

5.6.3 The construction industry

The construction industry needs to adopt proactive steps that will ensure legal compliance and protection of employees; the following are the recommendations of the study; there is need to use a combination of measures such as engineering and administrative in combination with earplugs in NIHL prevention Active use of audiometry data to slow the progression of disease and referral system for interventions and treatment of staffs at risk is an essential step towards improving the quality of workers life and extending work life span. In addition, effective staffs training on noise exposures and prevention coupled with employee wellness programs that allow for' safe reporting' on noise concerns.

Change in industry culture towards hearing preservation that will impact individual construction company will save cost on work loss due to hearing-related health issues, improve productivity and save time and resources.

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References

Anjorin,S., Jemiluyi,A.&Akintayo,C. (2015).Evaluation of industrial noise:a case study of two Nigerian industry.www.pscipub.com [accessed 5 July 2019]

Akindele,A.,Mehlape,F.,Valoyi,M.&Talukhaba,A.[n.d].The impact of the influx of illiterate and foreign construction workers on the effectiveness of construction safety induction in South Africa.CIB10352.www.irbnet.de [accessed 5 July 2019]

Arenas,P.&Suter,A.(2014).Comparison of occupational noise legislation in the Americans:an overview and analysis.Noise Health.Sep.16.24(72):306-319.doi:16.72.306/140511

Aschengrau, A.&Seage,G. (2014).Essential of epidemiology in public health.3rd edition. Jones and Bartlett.

Ayessaki,W.Y.&Smallwood,J.(2015).The impact of noise on construction workers in South Africa. International conference on engineering, project and production management.Sep.15.doi:10.32738/CEPPM.201509.0042

Brink, H., Van Der Walt, C.& Van Rensberg,G. (2012).Fundamentals of research methodology for health care professionals.3rd edition, .Juta.

City of Tshwane:noise management policy:appendix A.www.tshwane.gov.za[accessed 8 July 2019]

Dement,J., Welch,L.,Ringen,K., Cranford, K.& Quinn,P. (2018).Hearing loss among older construction workers: updated analysis. American journal of industrial medicine. Feb.28.61(4):326335. doi: 10.1002/ajim.22827.

Ehrlich, R .& Joubert, G. Epidemiology. (2017). A research manual for South Africa (3rd edition). Oxford University Press.

Feresu,S. (2018).Conceptual phase of research . available from online.com.ujlink.uj.ac.za[accessed 15 July 2019]

Feresu,S.[n.d].Research questions, goals, aim, objectives, hypothesis . available from online.com.ujlink.uj.ac.za [accessed 15 July 2019]

UNIVERSITY OF JOHANNESBURG

Freuler,P.(2014).The top 6 noisiest jobs: hearing loss by occupation.www.audicus.com[accessed 14 Oct.2019]

Harris, I. & Brain, B. (2012). Introduction to qualitative data: collection methods.www.memebers.aamc.org[accessed 15 July 2019]

Hessel,A. (2013).A study of hearing loss among Alberta construction workers. Journal of occupational and environmental medicine.vol.42.1:1-38.ww.clra.org

House ,R., Sauve , J.& Jiang, D. (2010).Noise induced hearing loss in construction workers being assessed for hand held-arm vibration syndrome. June.2010.101(3):226-9. doi: 10.1007/BF03404378.www.ncbi.nlm.nih.gov

Johnson,T.,Cooper,S.,Stamper,G.& Chertoff,M.(2017)Noise exposure questionnaire (NEQ).a tool for quantifying annual noise exposure.Journal of American academic audiology.Jan.28.1:14-35.doi.10.3766/jaaa.15070.www.ncbi.nlm.nih.gov

Journal of occupational and environmental medicine. (2013).Noise induced hearing loss.vol.45.6:579-581

Kantova,R.(2017).Construction machines as a source of construction noise.Procedia engineering.190:92-99.www.sciencedirect.com

Kowalska-Shiwinska,M.&Davis,A. (2012).Noise induced hearing loss. Noise and health international journal.vol.14(61):274-280.www.noiseandhealth.org.

Kumar,R.(2011). Research methodology .Chapter 12-18.3rd edition.Saga.

Luman,M.(2016).Noise induced hearing loss in construction.International safety equipment association.Dec.12(16).www.safetyequipement.org

Mazlan,A.,Yahya,K.,Haron,Z.,Mohamed,N.,Rasid,A.,Jamahedin,N.&Derus,N.

(2018).Characteristics of noise-induced hearing loss among workers in construction industries. E3S

Web of Conferences 34, 02025.https.//doi.org/10.1051/e3sconf/20183402025

Morata, C.&Meinke,D.(2016).Uncovering effective strategies for hearing loss prevention.Acoust Aust.Apr;44(1):67-75.doi.10.1007/s40857-016-0044-9

UNIVERSITY OF JOHANNESBURG

Nieuwenhuis,J.(2014). Qualitative research session 3:data gathering.www.up.ac.za[accessed 14 Oct.2019]

Nijhawan,L.,Janodia,M.,Muddukrishna,S.,Bhat,K.,Bairy,L.,Udupa,N.&Musmade,P. (2013).Informed consent: issues and challenges. Journal for advanced pharmaceuticals technology& research.Jul-Sep; 4(3): 134–140.doi: 10.4103/2231-4040.116779

Pelegrin AC, Canuet L, Rodríguez ÁA, Morales MP. (2015). Predictive factors of occupational noise-induced hearing loss in Spanish workers: A prospective study. Noise Health; 17:343-9. available from: http://www.noiseandhealth.org/text.asp?2015/17/78/343/165064

Rosso,M., Agius,R.& Calloja,N.(2011).Development and validation of a screening questionnaire for noise induced hearing loss. Occupational medicine.vol.61.issue 6.September.416421.doi.org/10.1093/occmed/kgr059.www.academic.oup.com

Sang,K.&Powell,A.(2012).Gender inequality in the construction industry:lesson from Pierre Bourdieu.Association of researchers in construction management.1.Sep.237-247.ARCOMproceedings of 28th annual conference.www.researchgate.net

Searchfield,G. (2014).Tinnitus what and where:an ecological framework.Dec.15(5). doi: 10.3389/fneur.2014.00271.www.ncbi.nlm.nih.gov

Seixas,N.,Neital,R.,Stover,B.,Sheppard,L.,Feerey,P.,Mills,D.&Kujawa,J.(2012).10years prospective study of noise exposure and hearing damage among construction workers. Occupational environmental medicine.69(9):643-650

Shukla,A.&Lal,P. (2017).Hearing loss and morbidity among construction site workers in national capital region of Delhi India.ICBEN.June;12;1-8.www.icben.org

Smit,R.(2017).References technique: Harvard style .4th edition. University of Johannesburg.

Sullivan,L.(2012). Summarizing data collected in the sample. Essentials of biostatistics in public health.35-66. 2nd edition.Jones and Bartlett.www.jblearning.com

Sweeney,E.(2018).The construction industry has a hearing problem.www.exaktime.com[8 July 2019]

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Turcot, A., Girard, S., Courteau, M., Paril, J.&Larocque,R. (2015).Noise induced hearing loss and combined noise and vibration exposure. Occupational medicine.vol.65. issue3:238-244. doi:10.1093/occmed/kqu214. www.academic.oup.com.

U.S Bureau of Labor Statistics.(2019).Household data annual averages: employed by industry and age.http//www.bls.gov[5 July 2019]

Yang,C.&Chung,J.(2016).Pathophysiology of noise induced hearing loss.Audiology&speech research.12(0):S14-16.doi:10.21848/asr.2016.12.SI.S14

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Appendix 1 HDC Letter

FACULTY OF HEALTH SCIENCES

HIGHER DEGREES COMMITTEE

HDC-01-126- 2019

9 March 2020

TO WHOM IT MAY CONCERN:

STUDENT: **OGUMINITRIN, L**
STUDENT NUMBER: **201338270**

TITLE OF RESEARCH PROJECT: Factors related to hearing loss among construction workers in Gauteng, South Africa

DEPARTMENT OR PROGRAMME: MASTER OF PUBLIC HEALTH

SUPERVISOR: Prof S Feresu **CO-SUPERVISOR:** -

The Faculty Higher Degrees Committee has scrutinised your research proposal and concluded that it complies with the approved research standards of the Faculty of Health Sciences; University of Johannesburg.

The HDC would like to extend their best wishes to you with your postgraduate studies

Yours sincerely,

Prof S Nalla
Chair: Faculty of Health Sciences HDC
Tel: 011 559 6258
Email: shahedn@uj.ac.za

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Appendix 2 Ethics Approval

FACULTY OF HEALTH SCIENCES
RESEARCH ETHICS COMMITTEE

NHREC Registration: REC 241112-035

ETHICAL CLEARANCE LETTER
(RECX 2.0)

Student/Researcher Name	Lara Oguntimirin	Student Number	201338270
Supervisor Name	Prof S Feresu		
Department	Environmental Health		
Research Title	FACTORS RELATED TO HEARING LOSS AMONG CONSTRUCTION WORKERS IN MIDRAND GAUTENG, SOUTH AFRICA		
Date	15 January 2020	Clearance Number	**REC-261-2020**

Approval of the research proposal with details given above is granted, subject to any conditions under 1 below, and is valid until 2021/01/14.

1. Conditions:
None.

2. Renewal:
It is required that this ethical clearance is renewed annually, within two weeks of the date indicated above. Renewal must be done using the Ethical Clearance Renewal Form (REC 10.0), to be completed and submitted to the Faculty Administration office. *See Section 12 of the REC Standard Operating Procedures*.

3. Amendments:
Any envisaged amendments to the research proposal that has been granted ethical clearance must be submitted to the REC using the Research Proposal Amendment Application Form (REC 8.0) prior to the research being amended. Amendments to research may only be carried out once a new ethical clearance letter is issued. *See Section 13 of the REC Standard Operating Procedures*.

4. Adverse Events, Deviations or Non-compliance:
Adverse events, research proposal deviations or non-compliance must be reported within the stipulated time-frames using the Adverse Event Reporting Form (REC 9.0). *See Section 14 of the REC Standard Operating Procedures*.

The REC wishes you all the best for your studies.

Yours sincerely.

Appendix 3 Consent letter from Construction site

First Safety Solutions (PTY) Ltd.
Reg no: 2016/537244/07
Tax no: 976 467 716 8
2 Aero Road
Bonaero Park
Kempton Park
1619

22/01/2020

Dear Lara
RE- APPROVAL TO UNDERTAKE RESEARCH ON FIRST SAFETY SOLUTIONS SITES

Thank you for your letter.
We are happy to inform you that your approval has been granted with the following conditions

- You must report to the site supervisors with this letter
- Induction must be done at every site for you and your team
- PPE must be used at all times on site

You will have access to 10 sites as requested; kindly provide dates when specific sites will be visited and time so we can ensure proper arrangements. Trust you will find this in order.

Faithfully
R.Kidson

Ruan Kidson (SAIOSH Registered) OHS Practitioner / Auditor (BSCIC)
Mobile: 081 524 1908
Mail: ruankidson@gmail.com
firstsafetyspec@gmail.com

Appendix 4 Questionnaire

Factors related to hearing loss among construction workers in Gauteng, South Africa

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CROSSING (×) THE RELEVANT BLOCK OR WRITING DOWN YOUR ANSWER IN THE SPACE PROVIDED.

EXAMPLE of how to complete this questionnaire:

Your gender?
If you are female:

Male	1
Female	2

Section A – Background information

This section of the questionnaire refers to background or socio demographic information. Although we are aware of the sensitivity of the questions in this section, the information will allow us to compare groups of respondents. Once again, we assure you that your response will remain anonymous. Your co-operation is appreciated.

1. Gender

Male	1
Female	2

2. Age (in complete years)

3. Ethnicity

Black	1
White	2
Coloured	3
Indian or Asian	4

4. Occupation

General worker	1
Labourer	2
Rigger	3
Carpenter	4
others	5

5. Your highest educational qualification?

Grade 11 or lower (std 9 or lower)	1
Grade 12 (Matric, std 10)	2
Post-Matric Certificate or Diploma	3
Baccalaureate Degree(s)	4
Post- Graduate Degree(s)	5

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6. How would you describe the area in which you are residing?

Urban	1
Rural	2

7. Location-where do you usually perform your duties?

Outdoors (open area or road)	1
Closed sites	2
In doors	3
None of the above	4
All the above	5
others	6

Section B

This section of the questionnaire seeks to gather information on family and personal history of hearing ability or disability.

8. Do you have relatives with hearing loss?

Yes	1
No	2

9. Have you had any problems with your hearing from childhood?

Yes	1
No	2
Don't know	3

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10. Have you had any injury to your ear?

Yes	1
No	2

If yes, kindly explain……

11. Kindly answer the questions below depending on frequency of occurrence

Never –not at all
Rarely- once in 3months
Often- once in a month
Always- daily

	Never	Rarely	Often	Always

Do you ear phones to listen to music?	1	2	3	4
How often do you listen to loud music	1	2	3	4
How often do you use ear plugs at work	1	2	3	4
How often do you clean your ear?	1	2	3	4
How often do you experience headache after working in noisy area?	1	2	3	4
How often do you experience ringing in your ears	1	2	3	4
How often do family and friends complain about your hearing?	1	2	3	4
How often do you turn up the TV volume?	1	2	3	4

12. Smoking habits

Current smoker	1
Never smoked	2
Quit smoking	3

13. Have you been exposed to any chemical(solvents)?

Yes	1
No	2
Not sure	3

14. Do you feel you have lost some of your hearing ability?

Yes, am certain I have	1
No, am certain I have not	2
Uncertain, not sure if I have or not	3
Uncertain, I have had suspicions	4

15. Have you been diagnosed with any of the following illnesses

Memory loss
Diabetes
Obesity
Cardiovascular diseases
Mental illness
Epilepsy

Yes	1
No	2

If yes, kindly indicate …….

15b. How many years have you been living with chronic disease …….years

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15c. Have you ever had an incident of chemical exposure?
if yes, kindly indicate which chemical……

Section C

This section explores occupational history, health and environment

16. How long have you worked in the construction industry?.....years

17. Have you had any hearing test done at work?

Yes	1
No	2

If yes, kindly indicate date of last testing ……dd/mm/yy

To what extent do you agree with each of the following statements? Please indicate your answer using the following 5-point scale where:

1. = Strongly disagree
2. = Disagree
3. = Neutral
4. = Agree
5. = Strongly Agree

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
18. Yearly haring test are conducted by employer	1	2	3	4	5
19. Ear plugs are provided when working in noisy area	1	2	3	4	5
20. I use ear plugs every time I work in noisy area	1	2	3	4	5
21. I use drillers at work	1	2	3	4	5
22. I use chainsaw at work	1	2	3	4	5
23. I use jackhammer at work	1	2	3	4	5
24. I use chop saw at work	1	2	3	4	5
25. I am always working in extremely noisy area	1	2	3	4	5
26. Noise levels are monitored at work	1	2	3	4	5
27. Ear plugs reduces noise intensity	1	2	3	4	5
28. Ear plugs are replaced yearly or when old and worn	1	2	3	4	5

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

Johnson,Cooper, Stamper,& Chertoff. (2017)
Rosso, Agius, & Calloja . (2011)

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Appendix 5 Information letter Rec 11.0

Information letter Rec 11.0

DEPARTMENT OF ENVIRONMENTAL HEALTH
RESEARCH STUDY INFORMATION LETTER
REC 11.0

2019/09/09

Good Day

My name is OGUNTIMIRIN LARA BUKOLA **I WOULD LIKE TO INVITE YOU TO PARTICIPATE** in a research study on Factors related to hearing loss among construction workers in Midrand Gauteng, South Africa
Before you decide on whether to participate, I would like to explain to you why the research is being conducted and what it will involve for you. **I will go through the information letter with you and answer any questions you have.** This should take about 30 minutes. The study is part of a research project being completed as a requirement for a master's in public health degree through the University of Johannesburg

THE PURPOSE OF THIS STUDY is to identify factors that contribute to hearing loss among construction workers in Midrand Gauteng South Africa.

Below, I have compiled a set of questions and answers that I believe will assist you in understanding the relevant details of participation in this research study. Please read through these. If you have any further questions, I will be happy to answer them for you.

DO I HAVE TO TAKE PART? No, you don't have to. It is up to you to decide to participate in the study. I will describe the study and go through this information sheet. If you agree to take part, I will then ask you to sign a consent form.

WHAT EXACTLY WILL I BE EXPECTED TO DO IF I AGREE TO PARTICIPATE? You will be required to answer questions relating to your knowledge, attitude and practise in protecting yourself from hearing loss at work and supply information on whether you have had a hearing test or not, we will also require consent to access your occupational health records

WHAT WILL YOUR RESPONSIBILITIES BE, AS THE RESEARCHER? I will ensure that you understand the questions asked and protect your privacy and confidentiality throughout the process

APPROXIMATELY HOW LONG WILL MY PARTICIPATION TAKE? Your participation will take approximately 30 mins

WHAT WILL HAPPEN IF I WANT TO WITHDRAW FROM THE STUDY? If you decide to participate, you are free to withdraw your consent at any time without giving a reason and without any consequences. If you wish to withdraw your consent, you should inform me as soon as possible.

IF I CHOOSE TO PARTICIPATE, WILL THERE BE ANY EXPENSES FOR ME, OR PAYMENT DUE TO ME?

You will not be paid to participate in this study and you will not bear any expenses

IF I CHOOSE TO PARTICIPATE, WHAT ARE THE RISKS INVOLVED? There are no risks involved in participating in this study

IF I CHOOSE TO PARTICIPATE, WHAT ARE THE BENEFITS INVOLVED? Participating in the study will allow for a contribution to the body of knowledge that can be used to improve hearing protection in the construction industry

WILL MY PARTICIPATION IN THIS STUDY BE KEPT CONFIDENTIAL? All reasonable efforts will be made to keep your personal information confidential and respect your right to privacy. This includes replacing your identifying personal information with a number that only I or my research supervisor will know. You will not be identified in any research reports that are published. Under some circumstances, such as when required to do so by a court of law, I may have to disclose your personal information. In addition, it may happen that your information will need to be reviewed by another organisation for quality assurance purposes. I will tell you about this if it happens.

Reports of audiometry testing will also be kept confidential and only the information will be extracted without indication of names or personal identifications.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY? The results will be written into a research report that will be assessed. In some cases, results may also be published in a scientific journal. In either case, you will not be identifiable in any documents, reports or publications. You will be given access to the results of this if you would like to see them, by contacting me.

WHO IS ORGANISING AND FUNDING THIS RESEARCH STUDY? The study is being organised by me, under the guidance of my research supervisor at the Department of Public health at the University of Johannesburg. This study has not received any funding.

WHO HAS REVIEWED AND APPROVED THIS STUDY? Before this study was allowed to start, it was reviewed in order to protect your interests. This review was done first by the Department of Public health, and then secondly by the Faculty of Health Sciences Research Ethics Committee at the University of Johannesburg. In both cases, the study was approved.

WHAT IF THERE IS A PROBLEM? If you have any concerns or complaints about this research study, its procedures or risks and benefits, you should ask me. You should contact me at any time if you feel you have any concerns about being a part of this study. My contact details are:

Oguntimirin Lara. +27781030668
opadejiomolara@yahoo.com

You may also contact my research supervisor:

PROF S.A FERESU
sferesu@gmail.com

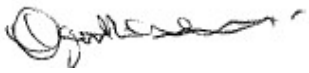
If you feel that any questions or complaints regarding your participation in this study have not been dealt with adequately, you may contact the Chairperson of the Faculty of Health Sciences Research Ethics Committee at the University of Johannesburg:

Prof. Christopher Stein
Tel: 011 559-6564
Email: cstein@uj.ac.za

FURTHER INFORMATION AND CONTACT DETAILS: Should you wish to have more specific information about this research project information, have any questions, concerns or complaints about this research study, its procedures, risks and benefits, you should communicate with me using any of the contact details given above.

Researcher:

OGUNTIMIRIN LARA BUKOLA



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Appendix 6 Research Consent Form REC 11.0

DEPARTMENT OF ENVIRONMENTAL HEALTH
RESEARCH CONSENT FORM
REC 11.0

FACTORS RELATED TO HEARING LOSS AMONG CONSTRUCTION WORKERS IN MIDRAND GAUTENG, SOUTH AFRICA

Please initial each box below:

☐ I confirm that I have read and understand the information letter dated Click here to enter the date, as is appears on the information sheet. for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐ I understand that my participation is voluntary and that I am free to withdraw from this study at any time without giving any reason and without any consequences to me.

☐ I understand that my occupational medical records will be accessed as part my participation in the study

☐ I agree to take part in the above study.

_____	_____	
Name of Participant	Signature of Participant	Date

_____	__ _____	
Name of Researcher	Signature of Researcher	Date

Appendix 7: Timelines

TASK	ASSIGNED TO	START	END
Submission of Proposal			
Format proposal and submit		6/26/19	6/21/19
Feedback, Corrections and Implementation			
Correct proposal as per supervisors' comments		8/12/19	10/30/19
Resubmission of proposal		11/01/19	
Approval and clearance by Ethics committee		11/02/19	12/08/19
Research Study			
Data collection		01/13/20	03/01/20
Data Analysis		01/13/20	03/01/20
Report writing		03/09/20	08/04/20
Submission of report			

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Appendix 8: Budget

Expenses	**Description**	**Cost**
Data analyst assistance	1 personnel	R250/day
Stationaries	Papers, pens, staples, ink	R500
Printing of data extraction forms	NA	R1000
Transportation	To construction sites	R1000
Data analysis	Data cleaning, statistical analysis, data usage	R3000
Total		**R6000**

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Appendix 9 Certificate from Editor

EDITING/PROOFREADING CONFIRMATION

To whom it may concern

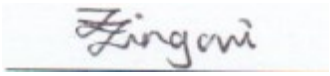
This serves to certify that I **Zvifadzo Matsena-Zingoni** have proofread and/or edited **Oguntimirin Lara Bukola 's** Masters Dissertation to ensure that the language, grammar, punctuation and spelling are academically sound and appropriate, by rectifying errors, wherever these have been identified, and rephrasing sentences that would possibly make one lose sight of the flow of the argument.

Title of the Dissertation:

FACTORS RELATED TO HEARING LOSS AMONG CONSTRUCTION WORKERS IN MIDRAND GAUTENG, SOUTH AFRICA

Editor's name: Zvifadzo Matsena-Zingoni

Qualification: MSc in Biostatistics (UZ)

Signature: 

Date: 9 July 2020

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Appendix 10 Certificate from Turntin

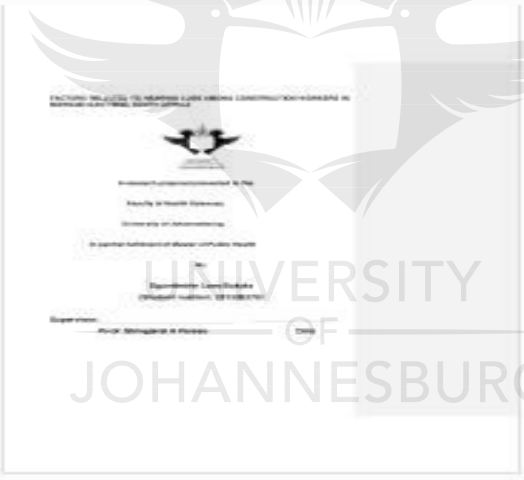
turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	LB OGUNTIMIRIN
Assignment title:	D3 Minor Dissertation I: Turnitin Ass...
Submission title:	FACTORS RELATED TO HEARING...
File name:	Oguntimirin_Lara_Bukola-MPH_Min...
File size:	924.91K
Page count:	73
Word count:	16,640
Character count:	96,196
Submission date:	13-Aug-2020 12:38PM (UTC+0200)
Submission ID:	1369122339



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